



GOVERNMENT OF KERALA

Kerala Public Works Department Manual
Revised Edition 2012

(Revised as per G.O.(P)No.13/2012/PWD dated 01.02.2012)



GOVERNMENT OF KERALA
Abstract

Public Works Department -Revision of PWD Manual - Approved - Orders issued.

PUBLIC WORKS (H) DEPARTMENT

G.O (P) No.13/2012/PWD

Dated, Thiruvananthapuram, 1st February, 2012.

- Read: 1) G.O(MS)No.34/2005/PWD dated 4.7.2005
2) Judgment dated 19.11.2010 in WP© No.28113/09 H and 30556/09 L
3) Judgment dated 19/12/2011 in WP© NO.33912/11
4) Lr.No.PWD/KSTP/PMT/79/01 dated 5.01.2012 from the Chief Engineer, KSTP.

ORDER

The PWD Manual is the basic document which outlines the functioning of the Public Works Department. The existing Manual was originally prepared in the year 1972 and since then the structure and functioning methodology of the department have undergone major changes. To keep pace with the contemporary requirement, Government of Kerala felt the need to update the PWD Manual incorporating the developments in the administrative and engineering fields to enhance skills and efficiency of the department. With this objective Government constituted a Sub-committee vide Government Order read as first paper above for reviewing the preliminary draft of the Manual prepared as part of institutional strengthening of PWD. As per the letter read as 4th paper above the Chief Engineer, KSTP has submitted final draft of the PWD Manual to Government for approval.

2. Government have examined the revised PWD Manual in detail and are pleased to order as follows:

- (i) The revised PWD Manual with the Quality Assurance /Quality Control Manuals for Minor & Medium works and Major works appended to the revised PWD Manual is approved.
- (ii) The data based on IRC Standards and MORTH specification for road works and CPWD specifications and National Building Code for building works along with PWD schedule of rates revised from time to time will be used for preparing estimates for PWD projects.

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- (iii) The relevant provisions in the PWD Codes and the other Codes will be revised on the basis of the revised PWD Manual.

(By Order of the Governor)

MANOJ JOSHI
Secretary to Govt.

To

- ✓ All Chief Engineers of PWD *CE, Admn.*
All Superintending Engineers of PWD (Through CE)
All Exe. Engineers of PWD (Through CE)
The Accountant General (A&E/Audit), Kerala, Thiruvananthapuram
The Managing Director, RBDCK, Preethi Buildings, Palarivattom, Kochi
The Managing Director, Kerala State Construction Corporation Ltd., 30/1521 A, Bay
Under the Bridge, Northern side of Railway, Ponnurunny, Vyttila - 682 019.
The Chief Operating Officer, Kerala Road Fund Board, Mayooram, Belhaven Garden,
Kowdiar, Thiruvananthapuram.
Local Self Govt. Department
Water Resources Department
Finance Department (Vide U.O No. 76418/Ind&PW.B2/11/Fin dated 15.11.2011)
Law Department (Vide U.O No. 24158/D1/11/Law dated 3.12.2011)
Personnel & Administrative Reforms Department (Vide U.O No. 21536/
B2/11/P&ARD dated 1.12.2011)
IT Department
Fisheries and Ports Department
~~Law Department~~
Information & Public Relations Department

Forwarded/By order



Section Officer

P R E F A C E

The PWD Manual is the basic document which outlines the functioning of the State Public Works Department. The existing Manual was originally prepared in the year 1972 and since then the structure and functioning methodology of the department have undergone major changes.

To keep pace with the contemporary requirements, Government of Kerala felt the need to update the PWD Manual incorporating the development in the administrative and engineering fields to enhance skills and efficiency of the department. With this objective Government have constituted a Sub-committee vide GO (MS) No.34/2005/PWD dated 04-07-2005 for reviewing the preliminary draft of the Manual prepared as part of institutional strengthening of PWD. The PWD Manual has been revised considering the relevant Government Orders and Departmental Circulars and incorporating the innovative reforms and best practices in construction technology.

The revised Manual has three parts in separate volumes (1) the Administrative Provisions (2) Work Methodology (3) Appendixes. It also lays down elaborate explanation and procedure of the PWD Code.

The revised Manual should be followed by the entire officers of the Department involved in Investigation, Design, Planning, Estimating, Bidding (Tendering), Execution and Maintenance of all types of works generally carried out by the various wings of PWD. The relevant codes shall also be revised.

Thiruvananthapuram
01.02.2012

MANOJ JOSHI IAS
Secretary to Government
Public Works Department

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Section 100**101. Introduction and Organizational Setup****101.1 General**

The PWD is the statutory authority for designing, planning, monitoring, constructing and undertaking maintenance of public works of the State Government, such as buildings, roads, etc, irrespective of the source of funds for the same. The Department also takes up works on PPP and Turn Key basis with financial support from outside agencies including International agencies.

102 Organizational set up

Each wing of the department is under the administrative control of a Chief Engineer, such as Roads and Bridges, Buildings and National Highways, there shall be one or more Circle under the control of Superintending Engineers under each Chief Engineer. Each circle consists of a number of Divisions under the control of Executive Engineers. The Divisions are divided into subdivisions under the control of Assistant Executive Engineers and the Subdivisions in turn are divided into a number of Sections under charge of Assistant Engineers. Chief Engineer (Administration and Designs) shall control the administration of the department, design, research, investigation, quality control and management, environment and social management & IT. There is a Design, Research, Investigation and Quality control Wing under the control of Chief Engineer (Administration & Designs) having Superintending Engineer's and other supporting staff. There is also an Architectural wing under the administrative and technical control of a Chief Architect for preparing Architectural drawings for PWD. A Deputy Chief Architect and other officers assist the Chief Architect.

Pattern of organization set forth above shall be modified, as and when decided by the Government consequent on the formation of projects for special purposes or on other grounds.

102.1 Head Quarters (Chief Engineer's Office)

The Chief Engineer is the administrative and professional head of each branch of the department and he is in control of and is responsible for its efficient functioning. He is also the technical advisor to Government on all matters relating to his branch. The Chief Engineer (A&D) shall be Ex-Officio Additional Secretary to Government. A Deputy Chief Engineer in the rank of Superintending Engineer and other technical and non-technical officers assist the Chief Engineer. The office organization shall include a technical wing and an administrative wing under the control of a Deputy Chief Engineer and financial wing under the control of a Financial Officer with sufficient complement of subordinate technical and ministerial staff. In addition to the above, the Chief Engineer who controls Buildings shall have an electrical wing under the control of a Superintending Engineer (Electrical) and an Electronics wing under the control of an Executive Engineer (Electronics). The office organization shall include an Environment and Social Cell also.

102.2 Circle Office

The Administrative unit of the department is the circle under the control of a Superintending Engineer who is responsible to the Chief Engineer for the administration and general professional control of public works within his circle. The Superintending Engineer has also powers of sanctioning estimates and entering into contracts within the limits of powers delegated to him. The Superintending Engineer shall be assisted by Deputy Superintending Engineer and other officers and support staff in the management of the office and control of the technical branch. There will also be generally a Financial Assistant to assist him in financial matters and an Administrative Assistant with supporting staff for administration.

102.3 Division Office

The main executive unit of the department is the division under the control of an Executive Engineer (divisional officer), who controls the work of all the subdivisions under his jurisdiction. The Executive Engineer is responsible for the proper execution of all works in his Division and also in guiding and controlling the subordinate officers in regard to investigation, designs, estimates etc. He has also powers of sanctioning estimates and entering into contracts within the limits of powers delegated to him. As disbursing officer of the Department, all payments for works, supplies and services shall be made by the Executive Engineer in the Division or through the Sub Divisions and Sections under him. The Executive Engineer shall render the prescribed accounts to the Accountant General. The Division Office shall have three branches, viz. Technical Branch, Accounts Branch and Establishment Branch. The Technical Branch shall be under an Assistant Engineer (Works), Accounts Branch under a Divisional Accountant and Establishment Branch under a Senior Superintendent in offices where such an officer is posted or by the Junior Superintendent with necessary technical and non-technical staff. The Deputy

Executive Engineer shall have control over the three branches and shall submit all files to Executive Engineer. He shall also hold charge of the office in the absence of the Executive Engineer.

102.4 Sub Division Office

The work of sections is controlled by a sub-division under the control of an Assistant Executive Engineer who is vested with powers, within his delegation, to sanction estimates, enter into contracts and make payments. The Assistant Executive Engineer has also to guide subordinate officers in the matter of investigation and preparation of estimates, and take all steps necessary to ensure that all works under charge of the subdivision are properly executed. He has to maintain and render accounts as prescribed in the rules and orders in force. Assistant Executive Engineer shall be subdivision officer of the department between Taluk & District level.

102.5 Section office

The lowest executive unit of the organizational set up is the section office under the control of an Assistant Engineer whose jurisdiction may be territorial or functional. In the case of territorial sections, all the works of the particular branch within the area of jurisdiction of the section will be under the control of the Section Officer or Assistant Engineer. In the case of sections other than territorial sections, the Section Officer or Assistant Engineer will be under the control of specific works or specific functions. For carrying out, executive and supervisory functions the section will have the required number of Overseers, and other staff like Drivers, Operators, etc. For assisting him in the ministerial work there will be a clerk attached to his office. Where the section is under the control of departmental execution of works, required staff shall be deployed. In addition to executive functions, the Assistant Engineer has to maintain the primary records of all transactions relating to works, supplies and services under his control and renders accounts to his superior authorities as per rules. Assistant Engineer shall be Taluk level officer of the department.

103 Functional Set Up

The work of the Department is carried out mainly through five wings, viz. Roads & Bridges, Buildings, National Highways, Projects and Administration & Design Wing, with an organisational set up covering the entire State. General matters, which are common to more than one branch such as Establishment, Vigilance etc., are handled by Chief Engineer Administration & Designs, with headquarters at Thiruvananthapuram.

There shall be a planning and monitoring cell, which is under the control of an Executive Engineer, in each wing. One or more Assistant Executive Engineers and Assistant Engineers shall assist the Executive Engineer. This wing shall be in synchronisation with National Informatics Centre to monitor the planning and progress of development schemes.

The concerned Chief Engineer heads each wing of the department. The Chief Engineer (Administration & Designs) is the authority for all administrative matters of the department. For technical matters, the concerned Chief Engineer is the final authority and he can render advice to Govt. as and when called for. However, Chief Engineer's Committee headed by the Chief Engineer (Administration & Design) shall decide technical matters common to two or more wings. The Government makes policy decisions

103.1 Administration

Chief Engineer (Administration & Designs) shall deal with matters common to all branches. The Chief Engineer under the control of administration shall deal with matters involving interpretation or modification of existing rules and procedures. He shall issue, revise or modify circulars pertaining to all branches in consultation with the Chief Engineers concerned or as decided in the Chief Engineers Committee.

103.1.1 Establishment

Chief Engineer (Administration & Designs) shall be controlling all Establishment matters of the department and shall be assisted by a Deputy Chief Engineer Administration and a Senior Administrative Officer. The Deputy Chief Engineer Administration and the Senior Administrative Officer shall be supported by an Administrative Assistant (General) and an Administrative Assistant (Ministerial) respectively with necessary complement of subordinate staff. They shall consult the concerned Chief Engineers if required whenever establishment matters relating to other branches are involved. Besides, there shall be an Administrative Assistant (Treasury) under the control of the Chief Engineer (A&D) and an Administrative Assistant (PF) under the control of the Chief Engineer Administration & Designs with necessary complement of subordinate staff.

103.1.2 Human Resources Development, Planning & Public Relations

The HRD Cell shall be headed by the Executive Engineer under the direct control of Chief Engineer (A&D). They are also responsible for the revision of Schedule of Rates and the Data Book.

103.1.3 Vigilance

The Deputy Chief Engineer, (Vigilance), shall assist Chief Engineer Administration & Designs to process the annual confidential reports of officers for promotion, conduct enquiries regarding allegations raised against any departmental staff, and randomly inspect offices and works for conformity with rules. An Executive Engineer, Assistant Executive Engineer, Administrative Assistant and Senior Superintendent of Vigilance wing and subordinate staff shall assist him in these activities.

The DCE (Vigilance) may also inspect important works after completion, as also during progress for ensuring (a) conformity to specifications (b) execution is as per accepted schedule.

104 Roads & Bridges

Roads & Bridges deals with planning, project preparation, construction and maintenance and arrangement of works of all State Highways, Major District Roads and bridges of the department. It has its headquarters at Thiruvananthapuram and is under the control of a Chief Engineer of the Public Works Department assisted by Deputy Chief Engineer, a Senior Finance Officer supported by technical and other ministerial support staff.

104.1 Planning

There shall be a planning section under an Executive Engineer (Planning). The planning section in the Chief Engineer's office is responsible for preparation of the Budget proposals, collection and processing of progress reports in coordination with the Circle and Division offices.

104.2 Road Safety

A Director in the rank of Superintending Engineer shall head the Road Safety Cell of the department. He shall be supported by Assistant Executive Engineers and Assistant Engineers with required support staff. It shall be the responsibility of the Road Safety Cell to co ordinate the road safety activities implemented by the PWD. However the implementation of road safety works shall be done through the regular Division offices. Director, Road Safety Cell shall liaise and correspond with Road Safety Authority at Govt. level.

104.3 IT Cell

Public Works Department shall have an IT Cell to coordinate the installation and maintenance of infrastructure facilities for computer hardware and software, and support systems like RMMS, GIS and FMS as well as to provide web connectivity through the PWD web Portal. An Executive Engineer supported by required Engineers and other support staff heads the IT cell. It shall also provide necessary training to all staff in consultation with the HRD Cell under Administration Wing. The Executive Engineer (IT) shall be the Nodal Officer for the implementation of IT in the department.

The functions of the Cell shall include the following.

1. Initiate steps to
 - a. Develop the PWD web portal.
 - b. Evolve PWD-specific IT strategic plan.
 - c. Prepare an IT enabled efficiency improvement framework including networking and applications for PWD operations.
 - d. Implement GIS & RMMS in road management.
2. Day-to-day system administration, content management and operation of the PWD portal.
3. Overseeing and monitoring the implementation of Financial Management System (FMS) in PWD.
4. Co-coordinating and facilitating training activities related to the above.
5. Co-coordinating and facilitating IT services and outsourcing activities of the department.
6. Identifying the best-of-class practices followed within and outside the country so that such measures as appropriate could be incorporated in PWD.
7. Any other function related to IT.

The expenditure on purchase and maintenance of necessary hardware, software and accessories and all related costs shall be met from the fund allocated in the budget exclusively for IT activities.

104.4 GIS and RMMS cell

There shall be a GIS and RMMS Cell in the Chief Engineer's office under the overall control of the Executive Engineer (IT) supported by technical and non-technical staff. (Details regarding their functions are enumerated in section 900 for GIS and section 1000 for RMMS).

104.5 Works funded by NABARD

The Nabard Cell in the Chief Engineer's (A&D) office, headed by an Assistant Executive Engineer, is responsible for obtaining project report from subordinate offices and scrutiny of the same for onward submission to Government /Nabard. Assistant Engineers support the Assistant Executive Engineer with necessary support staff. The Cell shall be responsible for monitoring the progress of all NABARD works and submit the monthly report to the Chief Engineer.

The Senior Finance Officer, Roads and Bridges shall collect the expenditure details from the concerned Divisions in the prescribed proforma consolidate and forward the details to the finance department for reimbursement.

104.6 Construction and Maintenance of Roads and Bridges

The construction and maintenance works shall be tendered, and agreement executed by the Superintending Engineers, Executive Engineers, Assistant Executive Engineers and Assistant Engineers concerned, as per the delegation of powers.

104.7 Quality Control Cell

There shall be a Quality Control Cell at state, zonal & district level under the Chief Engineer (Administration & Designs). There shall be Quality Control Cells at zonal level headed by Executive Engineer and at district level controlled by Assistant Executive Engineer. There shall be Assistant Executive Engineer and Assistant Engineer to support Executive Engineer at zonal level and two Assistant Engineers and supporting staffs for district level Cell. Each district shall be equipped full-fledged laboratory with essential quality testing equipments. The mandatory tests stipulated in the MoRTH and National Building Code for material and workmanship and shall be carried out as referred in the chapter for quality control (2401). This Cell also acts as Quality Assurance Cell at the time of preparation of DPR for works requiring pre-qualification of contractor.

104.8 Environment and Social Cell

An Executive Engineer shall head the Environment and Social cell, and will be assisted by an Assistant Executive Engineer (Environment)/ Environmentalist and an Assistant Executive Engineer (Social), Sociologist and other support staff. The Environmental and Social Cell shall necessarily vet all major projects costing above Rs. 15crores for which detailed project report shall be prepared by the Project Preparation Unit (PPU). The cell will provide advice on all aspects of the environment requirements included in the Manual and also be responsible for monitoring the effectiveness of the implementation. The cell shall also conduct random environment inspection/audit during and after execution of the project.

105 Buildings Wing

The buildings wing shall deal with planning, project preparation, construction, maintenance and arrangement of works including water supply, electrification and electronic works of public buildings. It shall have its headquarters at Thiruvananthapuram and is under the control of a Chief Engineer assisted by Deputy Chief Engineer and a Senior Finance Officer supported by technical and non-technical staff.

105.1 Planning

An Executive Engineer shall control the Planning Cell assisted by adequate technical staff. The cell is responsible for the preparation of the Budget proposals, collection and processing of progress reports in coordination with subordinate offices.

105.2 Construction and Maintenance of Buildings

The construction and maintenance of buildings works shall be tendered, and agreement executed by Superintending Engineers, Executive Engineers, Assistant Executive Engineers and Assistant Engineers as per delegation of powers.

The following special offices shall function under the Chief Engineer (Buildings).

Judicial Circle at Ernakulam headed by a Superintending Engineer, who shall be responsible for the administration and general technical control of judicial building works within the state. The Superintending Engineer shall be supported by Deputy Superintending Engineer, and other technical and non-technical staff.

Kerala Legislature Complex Construction Division under the Building South Circle in Thiruvananthapuram is exclusively for the works related to legislature complex and shall be headed by an Executive Engineer. He shall be supported by Deputy Executive Engineer, Divisional Accountant with necessary technical and non-technical subordinate staff. There shall be adequate number of Subdivisions and Sections exclusively for the works of the legislature complex. There shall be an Electronic Subdivision attached to this division.

There shall be a Special Building Division in Thiruvananthapuram under the Superintending Engineer (Buildings South Circle), for the construction of major buildings. The construction and maintenance works of Kerala Houses outside the state shall be under this Division. There shall be adequate Sub divisions and Sections under this Division.

105.3 Electrical Works

There shall be a Superintending Engineer (Electrical) in the office of the Chief Engineer, Buildings and shall assist the Chief Engineer on all matters concerning electrical works including preparation of specifications, data, etc for the whole state. There shall be a Deputy Executive Engineer

(Electrical) and other technical and non-technical staff for assisting in Superintending Engineer (Electrical). There shall be Division offices at different places in the state, each under the control of an Executive Engineer assisted by Assistant Executive Engineer (Electrical) and other technical and non-technical staff.

In the case of Irrigation Projects the electrical works shall be carried out through Electrical wing of P.W.D. Wherever necessary, the services of the Executive Engineer, Electrical Division shall also be availed for advice on matters connected with electrification and other electrical works with the approval of the Chief Engineer, Buildings. However urgent petty electrical works for the functioning of an office, the same may be carried out by the Admn. department using their own funds.

105.4 Electronics Wing

Electronics wing of PWD shall carry out the maintenance and operations of the sound system in the Legislative Assembly and arrange for the installation and maintenance of public address systems for all government functions and functions connected with the visit of VIP's and VVIP's. Installation and maintenance of all audiovisual equipments of government departments, installation and maintenance of intercom systems in government offices, TV sets in government buildings, rendering training facilities in electronic, equipments etc. shall be attended to by this wing. The Electronics wing shall also carry out the works connected with the installation, net working, repairs and maintenance of computers and auxiliary items in connection with computerization. The prevailing rules for audio visual equipments shall be made applicable to the computerization as well. The Electronics wing shall also assist the installation and maintenance of infrastructural facilities for computer hardware and software, and support systems like GIS, FMS and RMMS.

There shall be one Executive Engineer (Electronics) attached to the office of the Chief Engineer, Buildings and Sub divisions and Section offices at different places in the state with adequate complement of subordinate staff.

106 Architectural Wing

There shall be an Architectural wing headed by a Chief Architect. The Chief Architect is responsible for the preparation and finalization of all architectural drawings for buildings and similar works to be executed by the Public Works Department, in consultation with the Chief Engineer (Buildings) and concerned departments. Though primarily intended for the Buildings branch, the assistance of this wing shall be availed of for architectural designs in the other branches such as bridges highway structures land scaping and urban beautification etc. The Chief Architect shall be responsible for scheme of landscaping, layout, interior fittings, decorations etc. in the most economical manner.

A Deputy Chief Architect and other sufficient technical and non-technical staff shall assist the Chief Architect

107 National Highway Wing

National Highway wing shall deal with planning, project preparation, construction and maintenance and arrangement of works of all National Highways and it's bridges. It has its headquarters at Thiruvananthapuram and shall be under the control of a Chief Engineer of the Public Works Department assisted by Deputy Chief Engineer and a Finance Officer supported by technical and non-technical subordinate staff.

107.1 Public Private Participation Unit (PPPU)

There shall be a PPPU under the Chief Engineer, NH to deal with the PPP arrangements headed by Superintending Engineer supported by Executive Engineer, Assistant Executive Engineers, Assistant Engineers and with the assistance of Transport Economist from the panel of experts in Chief Engineer (A&D) office.

108 Projects

Externally aided projects and specialized projects shall be under the Chief Engineer (projects). Necessary technical and other staff, as per the requirement, supports the Chief Engineer. Functions of the Chief Engineer shall be decided as per the requirement of the project.

109 Design Research Investigations and Quality Control

Design, Research, Investigation and Quality control shall be headed by the Chief Engineer (A&D) and deal with design of buildings, bridges and other structures referred to it. In the design wing Directors in the grade of Superintending Engineer assist the Chief Engineer. The Chief Engineer (A&D) shall be assisted by an establishment wing in his office in all establishment matters.

109.1 Kerala Highway Research Institute (KHRI)

The Kerala Highway Research Institute at Thiruvananthapuram carries out research & quality control works and gives advice and guidance for advanced construction works undertaken by the department. The Institute shall be under the overall control of the Chief Engineer (A&D).

The Director (Research) assisted by Deputy Directors and Assistant Directors heads the institute. There are five divisions viz., Administration, Publication & Planning, Soil Mechanics and Foundation, Concrete, Traffic and Flexible Pavement, each headed by a Deputy Director and assisted by Assistant Directors.

Administration, Publication & Planning Division is responsible for the preparation and publication of research reports prepared by other Divisions and general administration of the Institute.

109.2 KHRI Laboratory

The KHRI Laboratory shall provide guidance in setting up the local laboratories, both in respect of equipping them and training the personnel. These laboratories shall carry out confirmatory tests of samples collected by the Assistant Executive Engineer (Quality Assurance)/Quality Assurance Units during routine inspections of various works at the site. Besides, calibration of equipment of field laboratory shall be another task assigned to KHRI Laboratory.

Soil Mechanics and Foundation Division shall be responsible for testing of soil samples, giving technical advice on the type of foundations for various structures, roads and embankments and remedial measures for failure due to foundation problems.

Concrete Division shall be responsible for testing of concrete cubes, cement mortar bricks etc. The Division shall be also responsible for preparation of lists on availability of various types of construction materials with name of places where they are available.

Traffic Division shall be responsible for conducting traffic studies in National Highways, State Highways, and Major District Roads & Other District Roads. The division shall also be responsible for conducting studies at accident-prone locations and suggesting remedial measures to eliminate possibility of accidents.

Flexible Pavement Division shall conduct studies on different types of road pavements. This division shall do experimental research work on various aspects in pavement design. This division shall also conduct research studies on pavements of roads subjected to traffic and construction problems. This institute shall cater to all the training requirements of PWD.

109.3 Quality Management Cell

There shall be a Quality Management Cell under the Director (Research) for monitoring the implementation of quality procedures in PWD. Testing of all State Government works shall be done at KHRI. It also conducts test for other departments and agencies on their request, by levying prescribed fees. All the necessary equipments and facilities for conducting all types of tests are available at KHRI and shall certify for quality of works.

109.4 Research

KHRI has necessary facility to take up all kinds of fundamental and applied research works. The Institute shall also take up research work on behalf of other public bodies subject to such terms as may be prescribed by the Chief Engineer (A&D). An advisory body of experts in different discipline of engineering shall be guiding the research and training needs. These experts shall be drawn from various centers of excellence. The Chief Engineer (A&D) in consultation with Govt. shall select these experts.

109.5 Project Preparation Unit

There shall be Project Preparation Unit under Director KHRI. The PPU shall prepare Detailed Project Report (DPR) of works costing more than 15crores. This limit shall stand modified to the extend proportional to the enhancement of schedule of rates as fixed by the Chief Engineer (A&D).

109.6 Library

All codes for reference, technical books and publications etc. for department shall be made available in a properly catalogued library formed in KHRI and Design Wing under Chief Engineer (A&D).

110 Financial Management System (FMS)

For the implementation of FMS, the setup shall be as follows.

Chief Engineers Office	Circle Office	Division Office	Sub Division Office
Sr. Finance Officer Asst Exe. Engineer (Planning)	Financial Assistant Asst Exe. Engineer (Planning)	Divisional Accountant Asst Engineer (Works)	Head Clerk Drafts man
Junior Superintendent LD/UD Clerk	Junior Superintendent Clerk (Budget Section)	Clerk (Budget Section)	Clerk

111 Repairs of Vehicles and Machineries

The repairs and maintenances of all the vehicles and machineries shall be attended to in consultation and with the approval, wherever necessary, of the Irrigation Department. The concerned Divisions shall conduct fuel consumption testing, estimates for repair and maintenance, work supervision for department

vehicles, inspection of and issue of fitness certificate for road construction equipments of contractors, work supervision for repair and maintenance of road construction equipments, road roller, refrigerators, chiller plants HVAC, Air conditioner set etc. They also conduct valuation of vehicles (also for confiscated vehicles), recommendation for condemnation etc. There shall be a mechanical subdivision with Assistant Executive Engineer and Assistant Engineer under the control of legislature complex building division for all its mechanical related works, erection, commissioning and repair of HVAC chiller plants, Lifts, etc. The Assistant Executive Engineer and two Assistant Engineers in the mechanical subdivision Alappuzha are attached to National Highway Division Alappuzha for operation, maintenance and repairs of equipments under National Highway wing, testing of fuel consumption, maintenance and repairs of vehicles of National Highway wing, inspection and issue of fitness certificate for road construction equipments of contractors of NH.

111.1 Workshops

For all departmental requirements, Government approved workshops may be approached. For major Projects, separate workshops may be established as part of the Project work at suitable places. These are generally of a temporary nature and the workshops may be closed after the project work is completed or retained in a reduced scale as a service workshop for the operation and maintenance of the completed project. The staff pattern shall be dependent on the size and character of the workshop.

112 Stores

There shall be stores for electrical and electronic materials attached to the concerned electrical Division and electronics wing. These stores shall be under the administrative control of the Executive Engineer of the concerned wing. The actual custody of the stores shall be with the Assistant Executive Engineer of the concerned wing of the PWD who shall operate the stores and keep accounts of transactions. The procurement of stores is arranged by the Chief Engineer (Buildings) with the assistance of the Superintending Engineer (Electrical) for electrical items and Executive Engineer (Electronics) for electronic items in his office.

113 Liaison Officer, High court

There shall be a liaison office headed by an Assistant Executive Engineer in the Advocate General's Office at Ernakulam for attending to the cases in the High Court of Kerala.

113.1 Liaison Officers in other departments

There are Liaison Officers in the rank of Executive Engineer of PWD in other departments to coordinate the construction activities of PWD for these departments viz. Directorate of Public Instructions, Directorate of Health Service, Police Department, Directorate of Collegiate Education, Directorate of Industries and Commerce Department etc.

114. Designers, Architects and Finance Specialist

If necessary the Chief Engineer (A&D) shall hire the services of experts of Designers, Architecture and Finance or any other specialists required by the department at the state level to advise the Chief Engineer (A&D) in finalizing the plans and designs of buildings and bridges and to advise on PPP projects from the panel of experts. The selection of experts for the panel shall be done by the Chief Engineer (A&D). The expenses for employing the experts shall be charged to the Project/work.



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Kerala Public Works Department Manual
Revised Edition 2012

PART – I

ADMINISTRATIVE PROVISIONS

Section 200**201. Duties and Responsibilities**

The duties and responsibilities of the officers of the department are given below. As regards other officers, they shall continue carrying out such duties and hold such responsibilities, as at present, based on existing rules, orders of superior officers and or conventions until they are modified.

The officers shall also be responsible for the duties and responsibilities assigned to the subordinate officers reporting to him in the office.

In addition, the following shall be considered as part of the duties of every officer of the department.

1. Every officer shall, if called upon by his superior officers, carry out as a temporary measure, in addition to his duties and responsibilities, those of another officer who is on leave or otherwise not available.
2. Every officer shall also carry out any duties as assigned to him by his superior officers.
3. If an officer has to be absent from his post on leave or for other reasons, he, or his superior officer shall make necessary arrangement, for the conduct of the work in the absence of the officer.
4. Every officer shall bestow adequate care on the protection of Government property entrusted to his charge.
5. Every officer shall carry out such work as he may be called upon to do from time to time by Government or the superior officers.
6. Every officer must safeguard the interest of the State particularly, in emergencies and unforeseen circumstances.
7. Every officer shall co-operate with other officers of the department and officers of other departments wherever necessary for the proper conduct of Government business.
8. PWD Officers who control works shall see that the provisions of the safety code and protection arrangements are strictly adhered to. Inspecting officers shall take necessary action in this regard.
9. All Engineers are responsible for ensuring that the environmental requirements warranted in the Manual are met in their respective job functions.
10. Wherever necessary, adequate fencing or other means of isolating weak spots in structures under use shall be provided until the weakness is removed. In addition warning notices shall also be displayed.
11. In respect of structures under maintenance of the PWD, vulnerable portions shall be inspected and if any weakness is noticed steps shall be taken urgently to strengthen or replace the weak portions of the structure. Chief Engineers shall issue appropriate detailed instructions in this regard applicable to various types of structures like roads, buildings, bridges, under passes, flyovers and culverts etc.
12. PWD Officers shall see that sufficient environment protection arrangements are strictly observed in the office premises as well as at work sites. Inspecting officers shall take necessary action in this regard.
13. Every officer in charge of project preparation and execution shall see that minimum destruction is caused to individuals or community in terms of loss of physical assets, access and livelihood.
14. In the case of accidents, the responsibilities of each officer shall be as detailed in Section 1000
15. If there is obstruction in the discharge of duties of any officer by an outsider, it will be proper for the officer to have the obstruction removed either directly or with the help of the police.
16. Every officer shall guide and control the work of his subordinates. If there is any disobedience, malingering, insolence, etc on the part of the subordinates, it is open to the controlling officer to initiate disciplinary proceedings against them after reporting the matter to the higher authority.

202 Duties and responsibilities Common to Specific Posts**202.1 Chief Engineer**

It shall be the responsibility of Chief Engineer to ensure that the functions relating to his wing are carried out efficiently. For this purpose he shall among other things arrange to:

1. ensure that policies of government in regard to development programmes are implemented in a timely manner.
2. plan, organise and co-ordinate works based on budget allocations.
3. advise government on all technical matters under his control through the Chief Engineer Administration & Designs or those referred by the government.
4. give timely instructions and guidance to subordinate officers on various matters.
5. issue approval for publishing the information on the website (WINGS) relating to his wing.
6. inspect major work sites and works which require his guidance or instruction, record the comments in the work spot order book and circulate the inspection note to all concerned for follow up action

7. have a proper assessment of the requirements of essential items of stores and to have them procured, stocked and distributed according to necessity.
8. allot funds under various heads as per budget allocation to the various divisions.
9. ensure that works being tendered has sufficient fund allocation.
10. exercise administrative, financial and technical powers delegated to him.
11. see that the rules regarding accounting and financial control at various levels are properly enforced
12. prepare details for answering legislative assembly questions, submissions and budget speech for the Government.
13. have a system of monitoring the progress of work and the appropriate corrective steps wherever required.
14. Before the commencement of a financial year, the Chief Engineers shall prepare a programme on all ongoing works and submit to Government.
15. The Chief Engineer shall, without waiting for any notice or call from Public Accounts Committee/Committee on Public Undertakings, submit explanatory notes on paragraphs and reviews included in Audit Reports, C & A G Reports indicating the action taken or proposed to be taken. This may be done within a period of two months of publication/presentation of reports in the Legislature.
16. submit monthly statements showing progress of clearance of audit objections to the Administrative Department of the Secretariat and take necessary steps to clear such objections before the close of the Financial year
17. designate a senior officer for ensuring prompt attention to audit objections and inspection reports
18. periodically review and monitor the quality control system.
19. accord sanction for investigation estimates according to powers delegated
20. review progress of works in half yearly conferences. His observations shall be recorded in the minutes, which shall be forwarded to all subordinate officers
21. allocate the maintenance fund to each Division at the start of every financial year by setting apart a portion of it as reserve for carrying out emergency works.
22. scrutinize the details furnished in the budget estimates submitted by the Divisional /Circle Officers and furnish proposals to government.
23. approve the proposal for departmental execution and issue orders fixing the ceiling cost.
24. report to Government on old curiosities, relics, coins, minerals and any other item of archaeological importance found on excavation any ancient masonry or other old work of interest be opened up, or any religious edifice or relic be involved in removal or destruction in the execution of a work
25. participate in meetings of Government tender committee, Chief Engineers' committee and Chief Engineers' tender committee.

In addition to the above, the Chief Engineer will also carry out such other functions assigned to him by government by virtue of any Act or Rules.

202.2 Chief Engineer Administration & Designs (CE(A&D))

In addition to the duties and responsibilities prescribed under 202.1, the Chief Engineer (Administration & Design) shall be responsible for the efficient and effective functioning of the department and responsible for the administration of PWD in following.

1. Convene Chief Engineers' committee.
2. finalize structural design.
3. Vetting of environmental and social safe guards in all major projects.
4. co-ordinate function of all wings of PWD such as Roads, Bridges, Buildings, National Highways and Projects and liaison with government in all matters.
5. CE(A&D) shall be responsible for all administrative and establishment matters of all employees of PWD.
6. Periodical updating of schedule of rate, plinth area rate and standard data book.
7. CE(A&D) shall be responsible to all matters relating to HRD cell, KHRI, Vigilance cell, Structural design, quality control, environmental, legal & social management, NABARD cell, PPU & PPP / BOT arrangements.
8. CE(A&D) shall ensure that all the inputs and infrastructure facilities are provided to all the offices under the PWD to carry out the entrusted duties.

In addition to the above, the Chief Engineer (Administration & Design) shall also carry out such other functions assigned to him by government by virtue of any Act or Rules.

202.3 Deputy Chief Engineer

Superintending Engineers posted in the Chief Engineer's office shall be designated as Deputy Chief Engineer and shall assist Chief Engineer in all official matters.

202.4 Superintending Engineer

The Superintending Engineer shall be controlling a circle and has to exercise administrative and technical control over the various Divisions under his jurisdiction in order to ensure efficient functioning of the departmental activities in that circle. His responsibilities shall include:

1. Issue of appropriate instructions in regard to investigation for new works wherever necessary.
2. Giving guidance in the matter of design to be followed for major works or works of a complicated nature.
3. Obtain the DPR of original works from the Executive Engineer and process the DPR within his powers and submit to the Chief Engineer if exceeding his powers of sanction.
4. Scrutinizing estimates and revised estimates, supplemental estimate requiring sanctions of authorities higher than the Executive Engineer and sanctioning them or seeking sanction thereof in accordance with the delegation of powers after verifying through site inspection the correctness and adequacy of the proposal.
5. Inviting tenders through the PWD Website/print media and arranging contracts of works, supplies etc, in accordance with rules and the delegation of powers and for all prequalification works
6. Periodically inspecting all important works and also the works, which require his guidance in the matter of execution; Inspections shall be purposeful and shall cover examination of quality, progress, difficulties in execution etc. To record the comments in the work spot order book and circulate the inspection note to all concerned for follow up action
7. Checking expenditure against budget grant as a subordinate controlling officer and taking timely steps to move for re-appropriations, surrender of funds or supplemental grant as may be necessary.
8. Ensuring that sanctioned staff is made available in the various offices etc. under his jurisdiction by recruitment, promotion, transfer or otherwise as per rules.
9. Inspecting the Division offices under his jurisdiction annually with a view to ensure that the work of the Divisions is carried out efficiently. The inspection shall cover various aspects of the questionnaire given as Appendix 200A and the same forwarded to concerned Chief Engineer.
10. Controlling the matters connected with the establishment under his jurisdiction such as leave, transfers and postings, promotions, disciplinary action etc.
11. Collecting, scrutinizing and coordinating all necessary information for the preparation of budget estimates of the circle under his jurisdiction.
12. Giving technical advice or opinion on matters within his jurisdiction referred to him by Government, other heads of department etc.
13. Directing relief and protection measures to be taken with the resources available under his jurisdiction in the event of unforeseen calamities like flood, fire, earthquake etc. In the event of such work being organized by other departments, cooperating with such work to the extent necessary.
14. He shall hold quarterly conference with Executive Engineers under his control to review the progress of various works record and circulate the minutes and report to the Chief Engineer,
15. Suggesting measures for improving the technical and administrative efficiency of the department taking into account the technical development, which has taken place and other relevant matters.
16. Monitoring the follow-up action for ensuring timely response of State Government to a audit para, draft paras and there shall be a system for discussions with the Principal Audit Officer
17. Forward the cases to be placed before the Government Pleader/Arbitration Committees with relevant proforma details and sufficient number of copies of notes etc. to the Government.
18. To conduct an independent quality assurance and technical audit of works
19. To suggest remedial action required to rectify the defects mentioned in the Inspection Report of Quality Control Cell.
20. To initiate action against contractors doing inferior quality works based on the report of the Quality Control team.
21. To conduct technical audit in files in respect of all Divisions under the circle every year and also check the bills finalized during the last year.
22. To review functioning of the field testing laboratories and suggest remedial measures for improving the standard of their performance.
23. To recommend and submit the workable rate for the entire work for departmental execution

202.5 Senior Sociologist/ Social Development Specialist

1. To advise PWD on all social issues and provide expert opinion on resettlement and the rehabilitation.
2. Screen all initial SIA checklist and identify area of planning and other intervention.
3. Prepare TORs for preparation of detailed Social Impact Assessment (SIA) and Resettlement Action Plan(RAP)
4. Assets evaluation and selection of firms/agencies for preparation of RAP.
5. Monitor progress of SIA and RAP and clear projects requiring statutory social clearance.
6. Organise and conduct training programmes for field officers.
7. Advise field officers on matters relating to Land Acquisition, Resettlement and Rehabilitation
8. Evaluate SIA and Implementation of RAP.
9. Manage state level data base, update and prepare quarterly and annual reports.
10. Participate in inter disciplinary teams that may be constituted by PWD for implementation of projects within or outside the state as and when required.

202.6 Executive Engineer

The Executive Engineer shall be responsible for the proper execution of all works under his charge. For this purpose he shall take timely action for the following:

- 1) Ensure that the project reports are prepared and sanctioned in time.
- 2) To inspect the sites during scrutiny of estimates for verification of the correctness of the estimates and adequacy of the provisions and give instructions wherever required.
- 3) To move and obtain possession of land required for the execution.
- 4) Invite tenders as per rules and to make contract arrangements.
- 5) To forecast and take steps to procure required materials and tools and plant for departmental work and for meeting departmental obligation in contract work.
- 6) To provide adequate staff as per the operational needs of the Division. To supervise and manage these staff to ensure that they carry out the duties adequately and in a professional manner
- 7) To inspect works during execution and give instructions wherever required.
- 8) To arrange periodical payments and watch expenditure.
- 9) To deal with such other matters as may be found necessary for proper execution.
- 10) To test check 10% of value of all works beyond the TS power of Assistant Executive Engineer and to maintain a register for such check measurements.
- 11) To submit annual proposals for development or new construction, maintenance or repair works under his jurisdiction with all necessary information based on the Budget Manual
- 12) To review progress of works in monthly conferences. His observations shall be recorded in the minutes, which shall be forwarded to all subordinate officers
- 13) To consolidate progress report of works in his division to the Chief Engineer and Superintending Engineer before 15th of every month
- 14) To inspect sites where poor soil conditions exists and decide the number, location and minimum depth of bore holes to be taken.
- 15) To inspect and approve the foundation of works in which agreements are executed by an officer higher than the rank of an Assistant Executive Engineer
- 16) To prioritise the works in his jurisdiction at the start of the financial year
- 17) To prepare the list of items to be stocked for the project with the approval of the concerned Chief Engineer
- 18) To plan in accordance with the schedule of work and to fix the time frame of the project, in respect of contracts entered into by him and Superintending Engineer
- 19) To approve materials, mix design, job mix formulae, etc.
- 20) To check and submit the workable rate for the departmental execution
- 21) To record the comments in the work spot order book and circulate the inspection note to all concerned for follow up action
- 22) To keep on record & update from time to time the basic documents of property right of the Govt. /Department i.e., land plans & land records including land given on lease to private parties or corporations and Govt. level approved lease proposals & lease agreements signed by Assistant Engineer.
- 23) To check the logbook of the equipments, machineries, plants and vehicles.
- 24) To report to the Chief Engineer on old curiosities, relics, coins, minerals and any other item of archeological importance found on excavation of any ancient masonry or other old work of interest be opened up, or any religious edifice or relic be involved in removal or destruction in the execution of a work

- 25) To submit initial social assessment checklist along with all proposals for works to be reviewed by the social cell (preliminary project report).
- 26) To obtain clearance from social cell for all categories of A and B where ever land acquisition and displacement of people is involved, prior to execution of works.
- 27) To facilitate preparation of Land Acquisition Plan in co-ordination with Revenue Department.
- 28) To approve Social Impact Assessment (SIA) reports Land Acquisition Plan and Rehabilitation and Resettlement Plan and submit to HQ for review by Social Cell under Chief Engineer (R&B) along with detailed design report.
- 29) Executive Engineer should ensure that no tendering of works is done before getting encumbrance free land for a project.
- 30) To prepare the annual requirements of instruments based on the shortage arising either from inadequate supply originally or from some of the available instruments being in disorder in Divisions, Subdivisions and Sections
- 31) To propose the disposal of the plants at the place or where it is transferred and to conduct auction as per sanction received from competent authority
- 32) To inspect major buildings /structures periodically under his charge
- 33) To hire vehicles, if department vehicles are not provided, with the approval of concerned Chief Engineer
- 34) To issue permit for displaying boards in government property as per rules.
- 35) He shall be responsible for the proper maintenance and upkeep of all structures under the maintenance charge of the Division. In particular, he shall see that.
 - a. The structures are systematically and carefully inspected by himself or through his subordinates' particularly vulnerable portions thereof.
 - b. Timely action is taken to carry out essential works to prevent deterioration.
 - c. Regular maintenance works are carried out at the appropriate time.
- 36) As the disbursing officer of the Department in regard to works, supplies and services under his charge, he has to exercise proper control over the expenditure on these items in accordance with the rules and orders in force and render proper accounts for the same to the Accountant General in the prescribed manner. His responsibility in this regard is detailed in the Kerala Public Works Account Code.
- 37) The Executive Engineer shall exercise administrative control over the entire establishment of his Division and regulate the establishment expenditure in accordance with rules and orders in force. He shall also conduct periodical inspections of the Subdivision offices under his control at least once in a year with a view to see that the administration of the subdivision is carried on properly in accordance with rules and/or special instructions.
- 38) As an ex-officio member of the District Development Council, the Executive Engineer shall keep the council informed about the progress of works and other activities of his Division and also give technical advice on matters connected with works if called upon. He shall keep the Superintending Engineer informed of the decision of the council in regard to matters concerning his Division.
- 39) In the case of Executive Engineer controlling project and in other special cases, the control of some stores may vest with the Executive Engineer. He shall then exercise all the controls required in the matter of procurement, stocking, issuing and accounting of stores as a Divisional Officer under the control of stores.
- 40) The Executive Engineer is responsible for the collection, remittance and accounting of P. W. D. Revenue realisable through the Division. He has to maintain proper Division Cash Book statements and furnish quarterly statements to the Accountant General. He shall exercise proper control to see that the dues to Government are collected and remitted in time and leakages are prevented.
- 41) In case of emergencies such as serious natural calamities the Executive Engineer shall liaison with the District Collector and other authorities in protecting the life and property underthreat or damaged within the limit of his jurisdiction.
- 42) Test check of design, and estimate etc., sanctioned by Assistant Executive Engineer.
- 43) Ensure quality and environmental aspects of all works
- 44) Ensure that the MIS is regularly updated and forwarded to HRD Cell in the Chief Office on a monthly basis
- 45) Adopt the relevant quality control measures to ensure the desired quality of work.
- 46) Ensure proper quality of work as per specifications and for achieving designed life of the structure
- 47) Ensure that approved materials are used in the work.

- 48) Wherever necessary the Executive Engineer shall approve the sources or Samples for respective materials.
- 49) Ensure that all mandatory tests have been performed at the stage of each running bill, before payments. Executive Engineer shall verify and ensure availability of the required test equipments for field tests as well as an updated copy of specifications and copies of accepted schedule at sites of works.
- 50) Forward copy of all agreements executed by him and higher authorities to the Executive Engineer Quality Control.
- 51) Prepare list of selected contractors for limited tender.

202.7 Deputy Superintending Engineer

Executive Engineer posted in the Circle office shall be designated as Deputy Superintending Engineer and shall assist the Superintending Engineer in all official matters and he shall be the drawing and disbursing officer for the pay and allowances in the Circle office and shall be controlling officer of all other staff in the absence of Superintending Engineer.

202.8 Assistant Executive Engineer

1. An Assistant Executive Engineer controlling a Subdivision is responsible for the proper execution of all works in the Subdivision. This shall include the following
 - i. Arrangement of contracts within his powers following the prescribed rules.
 - ii. Forecasting the requirements of important materials to be supplied departmentally and make arrangements to procure them according to prescribed rules.
 - iii. Forecast requirements of various tools and plants for departmental execution.
 - iv. Check and approve setting out of works.
 - v. Inspect and approve foundations of structures with open type foundations, except massive structures as per design..
 - vi. Conduct soil tests and other tests wherever necessary as per general or special instructions.
 - vii. Personally supervise all works under his jurisdiction.
 - viii. Give suitable guidance to subordinates in regard to works under construction.
 - ix. Watch and take steps to see that progress as per schedule is maintained.
 - x. Administer the contract to ensure that the terms and conditions are adhered to.
 - xi. To check measure all concealed item of work and in addition 50% value of item of each work which are not concealed, and measured by Assistant Engineer (High value items in descending order). He shall also super check 50% value of each concealed item of work check measured by Assistant Engineer and 10% value of item of each work check measured by Assistant Engineer which are not concealed.
 - xii. Scrutinise, pass bills and make payments as per rules.
 - xiii. Obtain timely orders regarding deviations from and additions or deletions to the works as per sanctioned estimates if found necessary during execution and take follow up action by submission of Revised Estimate, Deviation Statement etc,
 - xiv. Ensure before the start of the work, initial levels and details of material collection reports are furnished to Chief Technical Examiner's office
 - xv. Ensure quality of works and compliance with environmental regulations
 - xvi. Ensure compliance with the formalities of R&R policy and LA Act. Prepare all necessary social reports.
 - xvii Adopt the relevant Quality Control measures to ensure the desired quality of work.
 - xviii Ensure proper quality of work as per approved specifications and for achieving designed life of the structure
 - xix Furnish details of mandatory tests verified by him along with running account bill.
 - xx Assistant Executive Engineer should be present in all major RCC works.
2. The Assistant Executive Engineer shall also be responsible for conducting proper investigation and scrutinising plans and estimates for new works in accordance with general and special instructions in this regard. This shall include:
 - i. Giving suitable directions to subordinates regarding information to be collected and nature and extent of survey work to be done.
 - ii. Checking site surveys, levels, nature of soil, sub soil, result of borings and all field data.
 - iii. Verification of the correctness of plans and adequacy of provisions in estimates by site inspection.
3. The Assistant Executive Engineer shall also be responsible for the proper maintenance of structures under his charge and this shall include:
 - i. Periodically inspecting all the building/ structures, particularly the vulnerable parts in accordance with general or special instructions in this regard.

- ii. Initiating timely action for special repairs where these are needed to prevent deterioration of structures under maintenance.
- iii. Making arrangements for the execution of maintenance works according to predetermined time table to suit the conditions.
- iv. Wherever any operations are involved as for instance in ferry service or sluice gates etc., ensuring that the operations to be carried out are in accordance with the designed scheme.
4. The Assistant Executive Engineer shall be responsible for the administrative control of the subordinates in his Subdivision and this shall include the following:
 - i. See that subordinate staff and labourers are posted in the concerned Sections and if any vacancies exist, take action for the same being filled up while at the same time make interim arrangements for carrying on the work.
 - ii. Periodically examine the adequacy or excess otherwise of subordinate executive staff and labour and take action for posting additional staff or for transfer of surplus staff according to circumstances.
 - iii. Oversee the work of the subordinate staff and see that lapses in regard to proper discharge of duties by any such personnel are dealt with promptly according to rules.
 - iv. See that the subordinate staff and labour are paid their wages/ salary promptly.
 - v. Periodically examine whether Government materials, Tools and Plants etc., under control of his subdivision are properly looked after and where necessary take steps to correct inadequacies. .
5. Maintaining accounts as per rules and rendering the required accounts to the Accountant General and other authorities as per rules.
6. To check and approve bench marks
7. To consolidate and forward progress report in the prescribed form for budgeted works and for other works to the Executive Engineer before 7th of every month
8. Approve formwork for all works.
9. To plan execution in accordance with the schedule of work and to fix the time frame of the project, in respect of contracts entered into by him
10. To check the reinforcement bars placed before concreting works
11. To scrutinize and submit the workable rate for the entire work for departmental execution
12. To record the comments in the work spot order book and circulate the inspection note to all concerned for follow up action
13. To maintain and update periodically the basic documents of properties of Govt. / Department i.e., land plans & land records including land given on lease to any agency or Corporations
14. To check periodically the log book of the equipments, machineries, plants and vehicles
15. To prepare initial Social Assessment checklist and inventory of private and public properties on the land needed for the departments and prepare LA and R&R Plan as per the PWD R&R Policy for approval by Executive Engineer.
16. To exercise the administrative control of stores.
17. To approve all foundations for which agreement is executed by the Assistant Executive Engineer.
18. To furnish details to PPU for preparing DPR.
19. To furnish details for structural designs / architectural drawings to the respectively.
20. Submit copy of all agreements executed by him to Executive Engineer (QC).
21. Details of works arranged during VVIP visit and details of works arranged on quotation basis waiving tender call to be furnished to Chief Technical Examiner as directed in GOs / Circular issued from time to time.

202.9. Deputy Executive Engineer

Assistant Executive Engineer posted in the Division shall be designated as Deputy Executive Engineer and shall be the controlling officer of all staff in the absence of the Executive Engineer.

202.10 Assistant Engineer

An Assistant Engineer posted in control of a Section is responsible for the proper execution of all works in his Section or under his charge. This shall include:

- 1 While setting out works check whether the works proposed are well within the land under the ownership of PWD.
- 2 Setting out works/ checking the same to see that works are carried out according to approved plans.
- 3 Forecasting and reporting the requirements of materials, tools and plant etc. required for works sufficiently early so that they could be arranged for and got supplied in time.
- 4 Taking and recording measurements and assisting in check measurements.
- 5 Scrutinising contractor's bills and recording accounts of materials, if any, issued for works.
- 6 Supervising the progress of works and taking steps to remove bottlenecks, if any.

- 7 Ensuring, in the case of contract works, that all the conditions of contract are properly observed and taking appropriate action if any of these are violated.
- 8 Keeping close watch of departmental works and taking necessary steps for ensuring the effective execution of all works.
- 9 The upkeep and maintenance of structures under his charge.
- 10 Survey, Investigation and collection of all field data necessary for construction of new works or alterations and additions to existing works or maintenance of existing structures which fall within his jurisdiction.
- 11 Preparing preliminary as well as detailed estimates and reports for new works and maintenance works and ensuring its correctness and adequacy.
- 12 Seeing that subordinate field staff are posted in the required places and that these persons are well acquainted with their duties.
- 13 Controlling and overseeing the work of subordinate staff.
- 14 The safe custody and rendering proper account (as per rules) of cash, materials, scientific instruments, tools and plant etc. entrusted to him or which pass through the section accounts.
- 15 Making arrangements for claiming and disbursing pay and allowances etc., for all subordinate staff and laborers as per rules.
- 16 Arranging urgent necessary action in case of an emergency to protect life and Government property.
- 17 Furnishing information required in so far as they relate to his Section, to answer interpellations in the Assembly, Parliament etc.
- 18 Making on the spot enquiries and submitting reports on matters referred to the Assistant Engineer by superior officers.
- 19 Making timely arrangements for disposal of unserviceable or surplus materials, tools and plant, scientific instruments etc.
- 20 Preparing and, submitting valuation report of buildings and structures, as required.
- 21 Adopting the relevant quality control measures to ensure that the quality of work is as per approved specifications so as to achieve designed life of the structure.
- 22 Responsible for carrying out field-tests correctly and timely communication of test results to authorities.
- 23 Incorporate details of mandatory tests done with every running account bill
- 24 To carry out investigation work.
- 25 To obtain the opinions of the officers of the concerned Department in regard to choice of site and features required for the work excluding technical details
- 26 To implement/ communicate to the contractor in writing the instructions and orders issued through the work spot order book by the higher officers
- 27 To forward progress report in the prescribed form for all works on or before the third day of every month
- 28 To approve all foundations for which agreement is executed by the Assistant Engineer
- 29 To plan execution in accordance with the schedule of work and to fix the time frame of the project, in respect of contracts entered into by him
- 30 To ensure taking possession of land for works after the disbursement of compensation and assistances as per the R&R policy of PWD.
- 31 To handover the site to the contractor or the authorised agent within ten days after executing the agreement
- 32 To measure and record the reinforcement bars placed prior to casting concrete
- 33 To check the quality of works and to see that the specifications are properly followed
- 34 To recommend application for extension of time of completion requested by the contractor
- 35 To submit the completion certificate along with drawings to the higher officers for approval
- 36 To take over the completed structure/work from the contractor after ensuring that all debris, balance materials, temporary construction etc., are removed and site cleaned up.
- 37 To hand over the completed works along with a set of completion drawings to the concerned officer of the other department/ agency
- 38 To prepare and submit the workable rate for the entire work for departmental execution
- 39 To arrange for removal/ demolition of inferior quality work if contractor fails to do so and charging the expenses to the contractor.
- 40 To keep on record the basic documents of property right of the Govt. /Department ie, land plans & land records including land given on lease to private agencies or corporations and update it from time to time
- 41 To sign lease agreements

- 42 To fix rent as per the guidelines prescribed and to furnish in the specified proforma as per delegation of powers.
- 43 To inspect all buildings /structures periodically under his charge
- 44 To check frequently the logbook written by the operator-in-charge of the equipments
- 45 Responsible for the verification, receipt, custody and issue of the stock materials and maintenance of initial accounts of all store transactions
- 46 To accord technical sanction for works within the powers of sanction of Assistant Engineer.
47. To check measure all concealed item of work and a minimum 50% value of item of each work which are not concealed for works of TS power of Assistant Engineer. To verify all the measurement recorded by the contractor. Assistant Engineer is fully responsible for all the measurements recorded .
48. Taking and recording measurements of works up to TS powers of Superintending Engineer and assisting in check measurements / super check measurements.
49. To intimate stage of works to EE/ AEE(QC).
50. To obtain quality certificate from EE(QC) before submitting work bill.
51. To prepare detailed programme of execution for projects in consultation with the contractor and ensure its achievements.
52. Petty repairs and maintenance costing up to Rs. 50000/- shall be arranged by the Assistant Engineers directly engaging labour under proper administrative sanction and technical sanction. Payment shall be made through HR claim.

202.11 Assistant Engineer (Works)

Assistant Engineer posted in the Division shall be designated as Assistant Engineer (Works) to assist higher officers.

202.12 Third Grade Overseer

1. When a Third Grade Overseer or other technical subordinate is posted for supervision of works carried out on contract, he must exercise proper care over the execution of the works and in particular attend to the following:
 - i) Assist the Assistant Engineer for collection of all field data for preparing layout, designs and preliminary estimates.
 - ii) Prepare detailed drawings based on field data and approved designs.
 - iii) Prepare detailed estimates as per approved designs, after obtaining instructions on provisions and rates from the Assistant Engineer.
 - iv) To see that the plans and specifications are followed in the execution of each item of work. Assist in setting out and in checking setting out of the structure.
 - v) Check the quality of materials on arrival at site, and to see that the materials comply with the specifications while in use.
 - vi) To watch the proportion of ingredients in mortars, concrete and bituminous premix, and ensure that they are as per standards specified for the particular item of work concerned.
 - vii) Check and see that the workmanship in the execution of work is good. Ensure that quality is maintained. Ensure the proper curing for cement works .The work of cement concrete / cement concrete with skin reinforcement shall be done under his direct supervision and ensure quality of all items of works measured by him.

In particular he shall be responsible for ensuring quality of certain items of work, which shall be done only under his direct supervision. These include earthwork filling for various purposes, rubble and brick masonry, plastering, road works, and formwork for R.C.C. and foundations of structures and usage of departmental materials as per specification.

 - viii) Ensure that proper care and protection is taken to avoid accidents or danger to workmen and third parties or to adjacent properties as per the safety code.
 - ix) Monitor that the contractor faithfully observes the general conditions of contract.
 - x) In the event of violation of any of the items (iv) to (ix) above, report the matter in writing to the Assistant Engineer immediately and abide by his orders.
 - xi) Maintain a work spot order book as per rules.
 - xii) Take charge of unserviceable dismantled materials obtained during the execution of the work and arrange for their disposal as ordered by higher officers.
 - xiii) Ensure that all safety provisions as per chapter 6 of Section II are complied with
 - xiv) Ensure that all materials at work site are kept in a safe manner.
 - xv) Keep in safe custody all scientific and mathematical instruments and tools & plant issued for a work.
 - xvi) Report the progress achieved at all stages of a work, and shortfall if any, with reasons.
 - xvii) Report completion of fixing of formwork.

- xviii) Supervise reinforcement work as directed by Assistant Engineer and report its completion.
 - xix) Report requirements of tools & plant required for a work in time and keep a watch over the proper use of tools and plant, if any, issued to contractors.
 - xx) Carry out any instruction received from higher offices from time to time regarding proper execution of a work.
 - xxi) Assist in taking levels and marking of level of structures during execution.
 - xxii) Plot the cross section (cs) and longitudinal section (ls) sheets and compute quantity of earth work.
 - xxiii) Assist the Assistant Engineer in preparing bills and making payments.
 - xxiv) Prepare draft letters and reports and put up for the approval of the Assistant Engineer and assist the Assistant Engineer in office works.
 - xxv) Furnish details on petitions after proper investigations, sanctions for road cuttings and other similar matters, with detailed site plans, wherever necessary.
 - xxvi) Bring to the notice of Assistant Engineer, encroachments on PWD roads/ Government land.
 - xxvii) To watch avenue trees and improvement in acquired land and report in writing any attempt of damage or removal.
 - xxviii) Take measurements; prepare plans and detailed calculations for fixing fair rent and valuation of buildings and collection of details of structures for verifying stability, as directed by the Assistant Engineer.
 - xxix) Take and record measurements of work up to TS power of Assistant Engineer and assisting in check measurements by Assistant Engineer and super check measurement by Assistant Executive Engineer.
 - xxx) Carry out any work assigned to him by his superior officers.
 - xxxi) To affix signature on all documents and records prepared by Third Grade Overseer.
2. When a Third grade Overseer or other technical subordinate is posted to supervise execution of works through departmental execution of works, his duties shall also include the following: -
- i) Rendering assistance to the Assistant Engineer or higher officers in setting out the works and taking measurements.
 - ii) Sending timely intimation to the Assistant Engineer on the requirements of materials, tools plant etc., so that there is no interruption or slackness due to lack of these items.
 - iii) Receiving, temporarily storing, accounting and issuing departmental materials required for execution of the work.
 - iv) Receiving, temporarily storing and issuing departmental Tools & Plant to the labourer as and when required and returning them to the store or such other place as directed by the Assistant Engineer, when the tools & plant are no longer required.
 - v) Mustering the labour twice every day and keeping the labour roll as per rules.
 - vi) Allotting work to individual workmen or groups of workmen in such a manner, to ensure efficient performance of the work.
 - vii) Taking such protective measures as are necessary to ensure safety of workmen and third parties, as also properties likely to be affected by the execution of the work.
 - viii) Keeping a close watch of the performance of the work and if necessary rearranging work and or regrouping workers to improve performance.
 - ix) Maintaining a record of the out turn of work every day, including issues of departmental materials, if any, and periods of working of departmental machinery, if any. All this information shall be noted down in a work spot order book and duplicate and triplicate copies of the same sent as daily reports.
 - x) Assisting the Assistant Engineer or other departmental officers in disbursing wages to the workmen after identifying them.
3. When a Third Grade Overseer or other technical officer is posted in charge of the maintenance of roads, bridges, or buildings or other structures, then his duties will also include:
- i) Making systematic examination of the various structures under his charge and report the condition and maintenance requirements to the Assistant Engineer.
 - ii) Where urgent steps are to be taken either for protection of property, life or restoring communications, as for instance prevention of breaches in roads, cutting and removing fallen trees from roads etc., these shall be arranged then and there and the fact reported to the Assistant Engineer on the same day. Departmental labourer shall as far as possible be employed for such purposes subject to availability.
 - iii) Supervising maintenance works and keeping accounts of materials used, departmental tools & plant etc.

- iv) Controlling the work done by Watchmen, Ferrymen, Lascars and other such persons who are to work under the Overseer's direction.
 - v) Carrying out supervisory and other duties on original or maintenance works done on roads, buildings or other structures under his control.
4. An Overseer Grade III, if posted in general charge of investigation and quality control work, shall in addition to the duties of Overseers detailed above be responsible for
- i) Investigation of works entrusted to him. This includes assisting in taking levels, site survey and all other measurements at site.
 - ii) Conducting soil investigation at locations identified by higher officers.
 - iii) Recording the SPT values and details of samples taken at each depth, during subsoil exploration and ensuring its accuracy.
 - iv) Issuing necessary instructions to plant operators, during soil investigation
 - v) They shall be responsible for the correctness of the survey work, levelling or any other fieldwork or collection of data entrusted to their charge.

202.13 First & Second Grade Overseers

I Grade or II Grade Overseer when posted in a section shall in addition to the duties entrusted to a III grade Overseer:

1. Assist in checking the detailed estimates for works and submit notes for issuing technical sanction or forwarding to higher offices.
2. Assist the Assistant Engineer in inviting tender, prepare tender schedule, acceptance of tender, executing agreement for works, passing bills and making payments and submitting notes for issuing orders.
3. Record in Measurement Books, all measurements of works within the T.S. Powers of Assistant Engineer.
4. Assist in preparing and disbursing wages of Casual Labour Roll
5. Prepare bills of works, for which he is authorised to take measurements.
6. Keep in safe custody, scientific, and mathematical instruments, tools & plant including machinery, pipes and accessories, spare parts of tools & plant, furniture registers, and work files of the section office and Measurement Books and Field Books issued to him and handover the above while on transfer, as directed by the Assistant Engineer.
7. Maintain files and registers relating to departmental Plant, MAS account, improvements in government land and other items.
8. Co-ordinate the work of subordinate Overseers.
9. Assist the Assistant Engineer to conduct joint inspection with revenue staff for verification of improvements and submit verification report for taking possession of acquired land.
10. Assist the superior officers in field work and submit the documents, reports etc to the higher officer under due authentication by affixing signature.

202.14 Tracer

A Tracer (in the cadre of third grade Overseer) in any PWD office shall carryout the following duties.

Prepare tracing of drawings.

Carryout any other work that may be specifically assigned to him by superior officers.

202.15 First & Second Grade Draughtsman

I & II Grade Draughtsman in PWD office shall carryout the following duties.

1. Prepare drawings based on instructions given to him by the Assistant Engineer (Works) / Assistant Director and higher officers.
2. Prepare tracing of drawings.
3. Plot survey work based on field data furnished to him and mark contours in survey drawings.
4. Check plotted sections and surveys received from subordinate officers with field book entries including checking reduction of levels.
5. Calculate quantities of various items of work involved from the designs and drawings of structures and prepare detailed estimate.
6. Prepare data for items of work based on schedule of rates, and information received from field regarding leads and lifts involved etc.
7. Check contractor's bills with regard to the estimates received from subordinate offices.
8. Verify issue of materials against requirement as per data in contractor's bill.
9. Prepare indents for departmental materials, Tools and Plant etc.
10. Prepare tender schedules and agreements.
11. Tabulate tenders.
12. Prepare draft letters and reports.

13. Carryout any other work that may be specifically assigned to him by Assistant Engineer (Works) and other superior officers.

202.16 Blue Printer

1. To take copies of drawings, documents as directed by superior officers.

203 Duties of various branches in the Chief Engineers, Circle, Division, and Sub Division offices

Each PWD office shall have technical, financial and establishment personnel. Each branch shall have the following duties.

203.1 Technical Branch

The Technical branch in a PWD office shall be responsible for taking action on the following,

1. Approval of structural designs.
2. Scrutiny of estimates: Any modification in the provisions in an estimate received from the subordinate office shall be made only after the specific orders of the head of the office. Scrutiny of estimate and issuing a copy of approved abstract of estimate, data and detailed estimate to lower level office for execution.
3. Scrutiny of estimates: Any modification in the provisions in an estimate received from the subordinate office shall be made only after the specific orders of the head of the office.
4. Issuing Administrative and Technical Sanction for estimates.
Scrutiny / sanctioning of revised estimate and issuing a corrected copy of revised estimate to lower level office for execution.
5. Preparation of tender schedule, tabulation of tenders.
6. Submission of tenders to higher authorities.
7. Scrutiny of tenders.
8. Preparation of agreement documents.
9. Maintenance of files for items of work entrusted to technical branch and work files
10. Scrutiny of bills - This shall include checking of issue of departmental materials, extra items, revised estimates, level calculation etc.
11. Checking of initial and final level calculations.
12. The Technical Branch shall do processing of survey report-verification of rates alone.
13. Scrutiny of maintenance estimate for Tools & Plant.
14. Maintenance of various registers relating to work, agreement and Tools & Plant.
15. Progress report and inspection notes of works.
16. Correspondence on all technical matters and works (except those relating to work bills)
17. Take over proposal of roads coming under local self-government
18. Issue of indents for bitumen, maintaining Indent Register.
19. Scrutiny of consolidated indent if any.
20. Any other work entrusted by the head of office.

203.2 Finance Branch.

The Finance Branch shall be responsible for.

1. Preparing monthly accounts and forwarding the same to Accountant General.
2. Preparing cheque for payment on passed bills.
3. Preparation of works budget.
4. Preparation of performance budget and revised budget.
5. Preparation of schedule of settlement with treasuries and maintaining proper registers.
6. Follow up action on audit notes of Accountant General relating to works.
7. Maintenance of audit files relating to works. (The work file and audit file shall be kept separately. The Technical Branch shall maintain the work file).
8. Scrutiny of bills and closing of work bills after audit. This shall include checking arithmetical calculations in Measurement Book, checking MAS account, Write Back Order (W.B.O), Work Abstract, checking quantities with schedule provisions etc.,
9. Maintenance of relevant registers such as MAS account, Survey Report, Cash Book, Work Abstract, Contractor's Ledger etc.
10. Processing of Survey reports.
11. Correspondence on finance matters.
12. Any other work entrusted by the Head of the Office.

203.3 Establishment Branch

Establishment Branch is responsible for the following.

1. Transfers and postings.
2. All establishment matters including leave, salaries, medical reimbursement etc.
3. Disbursing salary and allowances of staff.

4. Scrutiny of TA Bills
5. Preparation of establishment budget and revised budget.
6. Preparation of pension papers/sanctioning of pension.
7. Maintain the accounts of contingency funds.
8. Maintaining Service Books of all employees
9. Registration of contractors
10. Maintaining of all relevant registers.
11. Follow up action on audit notes of Accountant General.
12. General correspondence on establishment matters.
13. Receipt of tapals and putting up to Deputy Chief Engineer in Chief Engineers' office / Deputy Superintending Engineer in Circle office/Deputy Executive Engineer in Executive Engineer's office and Assistant Executive Engineer in Sub Division office.
14. Maintain inward and despatch registers
15. Any other work entrusted by the Head of the Office. The Head of Office shall obtain remarks of the Financial Assistant/ Financial Officer for the items mentioned in G.O. (P) No. 388/92/Fin dated 6.5.1992
The head of concerned branches shall forward files of works entrusted to them to the Deputy Chief Engineer in Chief Engineer's Office, Deputy Superintending Engineer in the Circle, Deputy Executive Engineer in Division office.
However the files relating to the following items within the responsibility of the technical branch shall be routed through the Divisional Accountant in Division Office and Finance Assistant in Circle Office and Senior Finance Officer/Finance Officer in Chief Engineer's Office.
 - i. Administrative Sanction
 - ii. Audit of work bills, vouchers etc.
16. Agreement for works executed in Division and Circle offices shall be handed over to the Divisional Accountant for safe custody
The head of department/office will obtain the remarks/view of the financial assistant/ senior finance officer on the following subjects before decisions are taken
 1. Proposal and allocation of funds for schemes
 2. Creation and upgradation of posts
 3. Public Accounts Committee/Estimate Committee and Subject Committee.
 4. Purchase of tools and plant, machinery and equipments or other stock and stores except petty items.
 5. Repair and maintenance of vehicle, machine other assets:
 6. Sanction of investigation estimates.
 7. Administrative sanction of schemes/works.
 8. Acceptance/recommendation of tender. quotation for purchase/works.
 9. Execution of agreements and powers of attorneys
 10. Acceptance and release of securities and release of retention of money.
 11. Risk and cost termination of the contracts and imposing fines of contractors.
 12. Registration, renewal and black listing of contractors.
 13. Vigilance and other court cases involving financial aspects including arbitration cases.
 14. Settlement of centrally sponsored scheme claims and adjustment of inter departmental State accounts
 15. Sanction of survey reports and sale by auction.

203.4 Nodal Officer

Every Office in the Department shall have a Nodal Officer for furnishing answers in the prescribed time to Legislative Assembly Interpellations.

The Nodal Officers shall be Deputy Chief Engineer in Chief Engineer's office, Dy. SE in Circle office, Dy. EE in Division Office, Assistant Executive Engineer in Sub Division Office and Assistant Engineer in Section Office.

204 Administration Wing

204.1 Chief Engineer Administration & Designs

In addition to the duties as per section 202.1, he shall also have the following administration duties:

1. Post adequate and suitable staff at the appropriate places as per proposal of concerned Chief Engineer and to take steps to correct deficiencies and imbalances if any.
2. Conduct Chief Engineers' committee meeting periodically.

3. To allot non gazetted officers to divisions / circles for reposting.
4. He shall be a member of Departmental Promotion Committee.
5. Initiate appropriate disciplinary action against deterrent member of staff based on the findings of the Vigilance Officer, with immediate report to Government.
6. Approve seniority list of various categories of PWD staff every year.
7. Submit proposal to revise Schedule of Rates.
8. Approval to periodical updating of standard data book

In addition to these duties he shall have the following technical duties:

1. Overall charge of Designs done departmentally using various methods including modern software's (purchased or hired) or through outsourcing.
2. Preparing a priority list for checking and approval of the designs, after consultation with other Chief Engineers.
3. To issue approval to detailed structural designs and detailed structural drawings for the construction of Government buildings, bridges and other structures.
4. To oversee environmental and quality control activities of all PWD works.
5. Inspect major works for guidance on design aspects.
6. Issuing administrative sanction to investigation estimates for which investigations are to be conducted under the direct supervision of the Director Research, Investigation and Quality Control.
7. To ensure management of local issues in all PWD works.
8. Approving sanction to investigation, investigation reports, preliminary project report and detailed project report prepared by PPU.
9. Issuing necessary Instructions to field officers on the design aspects of structures, if requested by them.
10. Select panel of experts in consultation with the Government.
11. Arranging purchase of books and periodicals for reference.
12. Arranging refresher courses and computer training for engineers of the various wings of the department.
13. Arranging training for newly recruited engineers of the department, within the first two years of service.
14. Identification of engineering colleges for deputing faculty members for senior students for quality monitoring of major works.
15. Identification of personal to facilitate research in KHRI.
16. To manage the computer cell.

204.2 Deputy Chief Engineer (Administration)

In addition to the duties as per section 202.3, he shall be responsible for the following

1. To assist Chief Engineer (A&D) to dispose all establishment matters including transferring, postings of non-gazetted technical staff.
2. Review of progress of preparing provisional seniority list of all category of employees.
3. Management of Personal Information System of the entire staff, etc in consultation with Chief Engineer (A&D).
4. To assist Chief Engineer (A&D) to conduct yearly employee satisfaction surveys, workload assessments.
5. Submit yearly proposals for variations in cadre strength based on the workload assessment in consultation with Chief Engineer (A&D).
6. To assist Chief Engineer (A&D) to prepare and publish provisional seniority list of each category periodically in the web.
7. Assist the Chief Engineer (A&D) for declaration of probation and in preparing details for Departmental Promotion Committee.
8. Conduct enquiries himself on cases of complaint if directed by the Chief Engineer Administration & Designs.
9. Assist the Chief Engineer in the preparation of press releases after observing norms.
10. To address Govt. on routine matters and communicate with Govt. on matters approved by Chief Engineer.
11. Shall be responsible in all matters relating to IT Cell, planning monitoring and budgeting.

204.2.1 Executive Engineer, Human Resources Development & Planning

He shall generally assist the Chief Engineer (A&D), on administrative matters and the specific duties related to this position are detailed below:

1. Deputing officers for various training programmes of the departments.

2. Prepare proposals for updating schedule of rates, plinth area rate , standard bidding document and standard data book and other assignments required.
3. If necessary, give advice to the officers conducting the enquiries about the correct manner in which the enquiries shall proceed.
4. Implement a Personnel Information System (PIS) including all employees of the Department.
5. Circulate notes and instructions regarding matters related to personnel management on approval by the Chief Engineer, Administration.
6. Forward proposals for restructuring the organisational set up of the department as and when required.
7. Keep watch on the progress of action taken against complaints in liaison with the Vigilance Wing.
8. Monitor the follow up action in processing of police verification report of new recruits.
9. Arrange induction training to all new recruits.
10. Monitor the issue of employee identity cards including timely replacement.
11. Review the draft programme for training staff in India/abroad and obtain approval from the competent authority.
12. Prepare a training budget for PWD and obtain approval/allotment from competent authority.
13. Review and finalise the training calendar for each year in advance and obtain approval from the competent authority.
14. Coordinate all training programmes for the personnel in the department.
15. Review the evaluation report on all training programmes conducted by PWD and issue necessary guidelines/instructions for better performance.
16. Evaluate the performance of trainers engaged by PWD and ensure that competent persons are handling the training sessions.
17. Coordinate with the nodal officers in each office and prepare notes for press releases in consultation with them.
18. Interact with personnel in the department to find out and resolve any hurdles that hinder his job performance.
19. Recommend rewards to employees in appreciation of their good performances.
20. To organize training / workshops to familiarise new materials / technology/ measures to engineers of the departments.

204.2.2 Assistant Executive Engineer, Human Resources Development

He shall assist the Executive Engineer, Human Resources Development & Planning and the specific duties related to this position are detailed below:

1. Prepare notes and instructions regarding matters related to personnel management for circulation.
2. Maintain the Personnel Information System (PIS) of the employees of the department.
3. Participate in the training programmes provided by the Enquiry Division.
4. Prepare schedule for providing induction training to new recruits.
5. Make a draft programme for training staff in India/abroad.
6. Organise training programmes for all categories of personnel in the department.
7. Prepare evaluation report on all training programmes conducted by PWD after analyzing the evaluation forms.
8. Make necessary arrangements to the issue of employee identity cards including timely replacement.
9. Ensure that Management Information System (MIS) is maintained in all districts and the reports reach the Headquarters on a monthly/quarterly/yearly basis.
10. Carry out the duties and assignments given by the Executive Engineer, Human Resources Development & Planning on a regular basis.

204.2.3 Assistant Engineer, Human Resources Development

In addition to duties as specified in clause section 202.10 he shall assist the Assistant Executive Engineer, Human Resources Development on the specific duties detailed under section 204.2.2

204.2.4 Assistant Executive Engineer, Policy Guidelines

He shall assist the Executive Engineer, HRD & Planning. In addition to duties as specified in clause 202.8, he shall be responsible for the development, monitoring and review of PWD policies and guidelines, including the Code and Manual and all Standards.

He shall also be responsible for the following.

1. Co-ordinating the periodical revision of the PWD Code and Manual, ensuring compliance with the Code and Manual.

2. Monitoring of the implementation and review of the Road Sector Policy.
3. Assist the Executive Engineer, HRD & Planning and the Committee of Chief Engineers to identify other needed PWD policies, and assist in the development and implementation of those policies.
4. In consultation with the various Chief Engineers identify the guidelines and standards needed for their Wing and co-ordinate the development and implementation of such Guidelines and Standards.
5. Preparing and maintaining a database of relevant Indian and International Standards relevant to PWD operations
6. Liaisoning with the Assistant Executive Engineer, Legal and Social experts, to ensure appropriate legal input and review of all policies in their drafting stages.
7. Assist the Executive Engineer, HRD & Planning, as required on all other Policy Guideline issues.
8. Any other duties assigned to him by the superior officers.

204.2.5 Assistant Executive Engineer (Planning), Administration

He shall assist the Executive Engineer, HRD & Planning, and his duties, in addition to the duties as per clause 202.8, are detailed below:

1. Assist preparation of annual Administration Reports.
2. Any other duties assigned to him by the superior officers.

204.2.6 Assistant Engineer (Planning), Administration

In addition to duties as per section 202.10, he shall be responsible for the following:

1. Assist preparation of annual Administration reports.
2. Any other duties assigned to him by the superior officers.

204.3 Deputy Chief Engineer (Vigilance)

The Deputy Chief Engineer (Vigilance) shall, in the capacity as vigilance officer have the authority to inspect, if necessary, all the Works of the Public Works Department and shall be responsible for the following, in addition to the duties as per section 202.3

1. Conduct enquiries regarding allegations against any P.W.D staff (ministerial and technical) and submit his findings and proposals to the Chief Engineer (Administration & Designs).
2. Initiate disciplinary action *suo moto and* submit the report to the Chief Engineer Administration & Designs. Conduct enquiry on complaints from the Vigilance, Anti Corruption Bureau, Govt. Officers, members of Legislative Assembly, general public etc. and submit the report to the Government/ Chief Engineer (Administration & Design).
3. Conduct departmental enquiries and if necessary frame charges against the delinquent employee(s) involved.
4. Conduct random inspection of PWD offices to ascertain whether all the records are maintained as per PWD Manual.
5. Collect annual Confidential Reports of officers in PWD and keep under safe custody after verification.
6. Forward Confidential Reports on request by DCE, Administration, for declaration of probation and for producing before the Departmental Promotion Committee.
7. Collect the landed property statement of all PWD officers and keep it under safe custody.

204.3.1 Executive Engineer (Vigilance)

In addition to the duties as per section 202.6 he shall be responsible for the following:

1. Assisting the Deputy Chief Engineer (Vigilance) in conducting enquiries regarding allegations against any PWD staff (ministerial and technical).
2. Random inspection of PWD offices in the state, and submitting the reports to the DCE.
3. Any other duties assigned to him by the superior officer.

204.3.2 Assistant Executive Engineer (Vigilance)

In addition to the duties as per section 202.8, he shall assist the Executive Engineer (Vigilance) in conducting enquiries against any P.W.D staff, inspection of PWD offices in the districts and submitting the reports to the Executive Engineer (Vigilance).

204.4 Assistant Executive Engineer, NABARD Cell

In addition to the duties as specified in section 202.8, he shall have the following duties.

1. Overall charge of NABARD assisted road, bridge and building projects and their implementation through territorial Roads and Bridges Division.
2. Co-ordinating with NABARD relating to financial assistance from NABARD.
3. Preparing annual plan of NABARD assisted road bridge and buildings projects for the state.
4. To examine proposals for construction of road bridge and buildings from the general public, MLAs, MPs etc. to utilise NABARD assistance road and bridge projects.

5. Preparing draft proposals for NABARD assisted projects, collecting drafts of Pre Feasibility Report(PFR), Feasibility Report(FR) and Detailed Project Report(DPR) and preparing revised drafts of the same in accordance with field requirements.
6. Ensuring that the details (environmental, re-settlement, feasibility etc.) required for Feasibility Report and Detailed Project Report are obtained.
7. Review of activities of NABARD assisted PWD Road Bridge and building projects and preparation of periodical reports.
8. Preparing technical reports, briefing papers etc for senior engineers.
9. Any other duties assigned to him by the superior officers.

204.4.1 Assistant Engineer, NABARD Cell

In addition to duties as specified in section 202.10, he shall assist the Assistant Executive Engineer, NABARD Cell.

204.5 Director, Building Design & Computer Cell

He shall be responsible /accountable to the Chief Engineer (A&D) in all official matters, with particular reference to the following:

1. Checking the designs prepared in his offices and recommends the same for approval by Chief Engineer (A&D).
2. If necessary, inspect the work, and give instructions to the subordinate officers.
3. Fixing the time schedule for completing a design work, including the maximum time granted to each officer to complete the work within his responsibility.

4. Arranging monthly conference of engineers of the in the first week of every month to review the progress achieved in the designs based on time schedule fixed, analyse the reasons for short fall and report them to the Chief Engineer (A&D).
5. Arranging technical discussion led by eminent engineers once in every month.
6. Exercising administrative and financial powers delegated to him
7. Issue necessary directions to Deputy Director Computer Cell regarding the procurement, maintenance, conducting training and updating of computer hard ware & software.
8. Assisting the Chief Engineer in any matter entrusted to him.

204.5.1 Joint Director, Building Design

He shall be responsible for the following, as instructed by the superior officers:

1. Finalize the key plan of buildings based on the architectural drawings approved by Chief Architect.
2. Arranging a preliminary discussion with the concerned officers.
3. Issue directions to Assistant Director and Deputy Director in design of structures and checking of drawings.
4. Review the design calculations of structures prepared by DRIQ Board including detailed checking of critical sections.
5. Review of drawings prepared in DRIQ Board including detailed checking of critical sections.
6. If the details for the preparation of a design are insufficient or are lacking, the same shall be called from the concerned officers under intimation to the Chief Engineer.
7. Inspecting site of works if necessary and issuing instructions to concerned officers regarding data to be collected.
8. Distributing design works among the various Assistant Directors and give them instructions from time to time regarding the design.
9. Calling for additional data if required.
10. Assisting his superior officers in any matter entrusted to him.

204.5.2 Deputy Director, Building Design

He shall be responsible for the following, as instructed by the superior officers:

1. Issue directions to Assistant Director for design of structures, checking the design calculations and drawings prepared in DRIQ Board effecting modifications, if necessary.
2. Assisting superior officers in checking designs of structures referred by the competent authority.
3. Carrying out field inspections, if necessary, with concurrence of his superior officers and collecting additional data required for design.
4. Assisting his superior officers in any matter entrusted to him.

204.5.3 Assistant Director, Building Design

He shall be responsible for the following, as instructed by the superior officers:

1. Preparing designs for various structures based on field data received and the preliminary discussion held with the field officers and instructions from superior officers.
2. Preparing design calculations and structural drawings conforming to the codal provisions.
3. Assisting his superior officers in preparing designs of structures referred to the design wing by competent Authority.
4. Scrutinising structural drawings prepared by Draughtsman.

5. Preparing notes on technical matters referred to him.
6. Assisting his superior officers in any matter entrusted to him.

204.5.4 1st & 2nd Grade Draughtsman (Building Design)

1. Prepare drawings based on instructions given to him by the Assistant Director and other higher officers.
2. To carry out duties assigned to him by superior officers.

204.5.5 Record keeper /3rd Grade Draughtsman (Building Design)

1. To arrange and keep original drawings.
2. To carry out duties assigned to him by superior officers.

204.5.6 Blue printer / Printing assistant (Building Design)

1. To take copies of drawings by blue printing or with wide format plan photocopier.
2. To carry out duties assigned to him by superior officers.

204.5.7 Deputy Director, Computer Cell

He shall be responsible for the following, as instructed by the superior officers:

1. Installation and maintenance of computers in DRIQ Board.
2. Procurement & supply of required consumables.
3. Exercise proper control over the expenditure on the above items as per the rules and orders in force and maintain proper accounts for the same.
4. Assist the Chief Engineer (A&D) in issuing Administrative Sanctions for Estimates for the procurement and maintenance of hardware and software installations.
5. Initiate action to prepare Administrative report.
6. Assisting his superior officers in any matter entrusted to him.

204.5.8. Assistant Director, Computer Cell

He shall be responsible for the following, as instructed by the superior officers:

1. Preparing estimates for the procurement and maintenance of hardware and software installations.
2. Keeping all the installations, software's and their licenses updated.
3. Initiate actions for purchase or hire of modern software for enhancing the performance of the Engineers.
4. Arranging necessary awareness program in association with software vendors.
5. Preparation of Administrative Report.
6. Any other job assigned by superior officer.

204.5.9 1st & 2nd Grade Draughtsman (Computer Cell)

1. To carry out duties assigned to him by superior officers.

204.5.10 System Programmer (Computer Cell)

1. To carry out duties assigned to him by superior officers.

204.6 Director, Bridges & PPU

He shall be responsible /accountable to the Chief Engineer (A&D) in all official matters, with particular reference to the following:

1. Checking the designs prepared in his office or submitted from various PWD offices and recommends the same for approval by Chief Engineer (A&D).
2. If necessary, inspect the work, and give instructions to the subordinate officers.
3. Fixing the time schedule for completing a design work, including the maximum time granted to each officer to complete the work within his responsibility.
4. Arranging monthly conference of engineers of the Engineers in the first week of every month to review the progress achieved in the designs based on time schedule fixed, analyse the reasons for short fall and report them to the Chief Engineer (A&D).
5. Arranging technical discussion led by eminent engineers once in every month.
6. Exercising administrative and financial powers delegated to him
7. Approve designs of structures referred to Chief Engineer (A&D) by Superintending Engineer or Executive Engineer.
8. Verify details taken during investigation and adequacy of the provisions of PPR and DPR.
9. Coordinate the activities of the Project Preparation Unit for Roads, Buildings, Bridges and National Highways.
10. Assist the Chief Engineer in other matters entrusted to him.

204.6.1 Joint Director, Bridges Design

He shall be responsible for the following, as instructed by the superior officers:

1. Receiving the project proposal from the Director (design) and distributing the same to Deputy Directors and Assistant Directors after a general viability check.
2. Issue necessary directions as and when required to the Assistant Director and Deputy Director in their work

- 3.If the design data received are insufficient / incorrect, additional details/ clarifications etc. shall be called for from the officers concerned under intimation to the superior officers.
- 4.Review the design calculations and drawings received from Deputy Directors and giving directions for corrections/revisions if found necessary
- 5.Inspecting site of works if necessary and issuing instructions regarding technical matters to the officers concerned before/during construction.
- 6.Assisting the superior officers in any matter entrusted.

204.6.2. Deputy Director, Bridges Design

1. The officer shall be responsible for the following
2. Receiving the project proposals from the Joint Director and distributing it to the Assistant Directors concerned.
3. Carrying out detailed discussions regarding the preparations of a proposal based on the received details.
4. Checking the designs and drawings submitted by the Assistant Directors in detail and issue instructions regarding corrections/revision if found necessary.
5. Carrying out field inspections, if necessary, with concurrence of the superior officers.
6. Assisting the superior officers in any matter entrusted.

204.6.3. Assistant Director, Bridges Design

The officer shall be responsible for the following

1. Examining thoroughly the details received from the superior officers before preparing design. In the process if any details are found missing or inadequate the matter shall be put to the notice of superior officers for acquiring the same.
2. Preparing designs conforming to the codal provisions, based on field data received and entrusting the draughtsmen for preparing the drawings.
3. Scrutinising drawings prepared by Draughtsman and issue instructions for correction/ revision.
4. Carrying out field inspections if necessary, with the concurrence of the superior officers.
5. Assisting superior officers in any matters entrusted.

204.6.4 1st & 2nd Grade Draughtsman (Bridges Design)

1. Prepare drawings based on instructions given to him by the Assistant Director and other higher officers.
2. To carry out duties assigned to him by superior officers.

204.6.5 Record keeper /3rd Grade Draughtsman (Bridges Design)

1. To arrange and keep original drawings.
2. To carry out duties assigned to him by superior officers.

204.6.6 Blue printer / Printing assistant (Bridges Design)

1. To take copies of drawings by blue printing or with wide format plan copier.
2. To carry out duties assigned to him by superior officers.

204.6.7 Joint Director, Project Preparation Unit

He shall be responsible for the following, as instructed by the superior officers:

1. Review of investigation works, investigation reports, SIA reports and feasibility of projects entrusted.
2. Review of interim report and DPR for the projects entrusted.
3. Issue proper guidance to all the activities to subordinate officers.
4. Any other duty assigned by the superior officers.

204.6.8 Deputy Director, Project Preparation Unit

He shall be responsible for the following, as instructed by the superior officers:

1. Check the preliminary and detailed investigation, Resettlement Action Plan (RAP) and Land Acquisition Plan (LA).
2. Check the feasibility report.
3. Check the interim report.
4. Check the Detailed Project Report.
5. Any other duties assigned by the superior officers.

204.6.9 Assistant Director, Project Preparation Unit

He shall be responsible for the following, as instructed by the superior officers:

1. Organize preliminary investigation for preparing feasibility report.
2. Preparing feasibility and interim reports for the projects entrusted.
3. Organize detailed investigation and local impact study for preparing Detailed Project Report.
4. Preparing DPR for projects entrusted.
5. Any other duties assigned by the superior officers.

204.6.10 1st & 2nd Grade Draughtsman (Project Preparation Unit)

1. Prepare drawings based on instructions given to him by the Assistant Director and other higher officers.

2. To carry out duties assigned to him by superior officers.

204.7 Director Research, Investigation & Quality Control

He shall be responsible for overall checking of the various tests, studies and research conducted in the Kerala Highway Research Institute.

He shall be responsible / accountable to the Chief Engineer in all official matters, with particular reference to the following:

1. Check the quality aspects of the works in the department.
2. To ensure that the quality levels of works specified are being achieved during execution of works and to report to the Chief Engineer (A&D).
3. Liaise with the divisions to ensure that the required quality is enforced in all works.
4. Issuing inspection notes of a site to the subordinate officers under intimation to concerned Chief Engineer.
5. Submitting quarterly progress report of the tests and research studies conducted by the Kerala Highway Research Institute to the Chief Engineer, (A&D).
6. Reviewing the progress of works undertaken by the KHRI every three months.
7. Assisting the Chief Engineer (A&D) in other matter entrusted to him.
8. Inspecting various sites, where investigations are in progress and issuing necessary instructions.
9. Assist the concerned Chief Engineer in issuing Administrative Sanction for investigation estimates.
10. Inspecting the sites, where investigation is in progress and issue necessary directions to the field officers.
11. Authorise the conduct of investigation works.
12. Ensure the collection of all necessary data required for the design.
13. Initiate actions for applied research
14. Assist the Chief Engineer in other matters entrusted to him.

204.7.1 Joint Director, Quality Management

He shall be responsible for the following, as instructed by the superior officers:

1. Assist the Director, Research & Quality Control, to implement, review and maintain the quality systems of works and propose additions whenever necessary, in the Standard Bidding Documents.
2. Co-ordinating the implementation of systems as per Quality Manuals.
3. Co-ordinate with the HRD Cell for the training on quality aspects for engineers and contractors.
4. Assisting the Director, Research & Quality Control, and the Committee of Chief Engineers to identify & formulate quality management documents and procedures for their branches, and co-ordinate the development and implementation of such quality management documents.
5. Liaise with the quality control units to ensure proper co-ordination and monitoring progress reports received from those units.
6. Review of the conditions related to the quality aspects in the Standard Bidding Documents for contracts and proposes alterations, if required.
7. Assist the Director, Research & Quality Control, as and when required.
8. Any other duties assigned by the superior officers.

204.7.2 Deputy Director, Quality Management

He shall be responsible for the following, as instructed by the superior officers:

1. Assisting the Joint Director, Quality Management, to implement, review and maintain the quality systems of works and propose additions whenever necessary, in the Standard Bidding Documents.
2. Co-ordinating the implementation of systems as per Quality Manuals.
3. Co-ordinate with the HRD Cell for the training on quality aspects for engineers and contractors.
4. Assisting the Joint Director, Quality Management, and the Committee of Chief Engineers to identify & formulate quality management documents and procedures for their branches, and co-ordinate the development and implementation of such quality management documents.
5. Liaise with the quality control units to ensure proper co-ordination and monitoring progress reports received from those units.
6. Review of the conditions related to the quality aspects in the Standard Bidding Documents for contracts and propose alterations, if required.
7. Assist the Joint Director, Quality Management, as and when required.
8. Any other duties assigned by the superior officers.

204.7.3 Joint Director (KHRI)

He shall be responsible for the following, as instructed by the superior officers:

1. As the disbursing officer of the department in regard to works, supplies and services under his charge he has to exercise proper control over the expenditure on these items in accordance with the rules and orders in force and render proper accounts for the same to the Accountant General in the prescribed manner. His responsibility in this regard is detailed in the KPWA Code.
2. Coordinate training of PWD officers in association with the HRD Cell.
3. Periodically publishing Technical Magazine comprising of research papers, training program, case studies etc.
4. Directing the subordinate officers for the conduct of various material tests conducting various surveys, purchase of technical periodicals for library, procurement of necessary softwares, etc.
5. He shall have overall control of all the testing and studies conducted by the institute.
6. Inspect various sites where tests and studies are in progress and issue instructions to subordinate officers.
7. Prepare inspection notes and communicate to field officers.
8. Submit monthly progress report of works undertaken by the Institute to the Director.
9. Prepare a program of research works intended to be taken up each year and submit it to the Director and Chief Engineer before 30th April every year.
10. Exercise administrative and financial powers delegated to him.
11. Assist the Chief Engineer in issuing Administrative Sanction for investigation estimates.
12. Arrange research-oriented studies, seminars and workshops.
13. Attend IRC meetings.
14. Participate in technical seminars and training conducted by other organizations.
15. Any other duties assigned by the superior officers.

204.7.4 Deputy Director (KHRI)

He shall be responsible for the following, as instructed by the superior officers:

1. Coordinate and arranging training of PWD officers with HRD Cell.
2. Directing the Assistant Directors for conduct of various tests & studies and issuing necessary instructions to his subordinate officers.
3. Co-ordinate purchase of technical periodicals for the library, conducting various surveys, etc. as directed by the Joint Director
4. Assisting the Joint Director in publishing Technical Magazine
5. Checking the readings and test results recorded by the subordinate staff and verifying the register of test results.
6. Submitting reports on the test results and studies to the Joint Director, after conducting independent tests, if necessary.
7. Controlling the work of subordinate technical staff attached to his division.
8. Corresponding with subordinate officers for furnishing additional data or other routine matters.
9. Arranging research oriented tests and studies
10. He shall exercise administrative and financial powers delegated to him
11. Forecasting the requirements of important materials, Tools and Plant and making arrangements to procure them according to prescribed rules.
12. Conducting material tests where ever necessary, as per general or special instructions.
13. Assist field officers in ensuring Quality Control.
14. Monitoring the progress of works in their respective Divisions.
15. Scrutinising and checking bills for making payments.
16. Periodically checking the prescribed accounts and furnishing the details to Joint Director as per rules and instructions.
17. Giving suitable directions to subordinate officers regarding information to be collected and nature of work to be done.
18. Checking survey works, levels, nature of soil, sub soil, result of borings and all field data of works undertaken by the Institute.
19. Administrative control of the subordinates officers, ensure adequacy of staff and labour, make interim arrangements for carrying out the work.
20. Periodically examine whether Government materials, Tools & Plants etc., are properly looked after and take steps to correct inadequacies.
21. Placing orders for supply of articles in accordance with rules and processing all orders so that all the requisite procedures are completed in time for receipt of articles.
22. Passing and payment of bills connected with stores transactions in accordance with rules.
23. Taking timely action to prevent deterioration of any of the items stocked in the stores and arranging disposal of unserviceable articles as per rules.

24. Maintaining accounts as per rules and rendering the required details to the Joint Director.

25. Ensure quality of works in compliance with environmental regulations.

26. Assisting the Joint Director in other matters entrusted to him.

204.7.5 Assistant Director (KHRI)

He shall be responsible for the following, as instructed by the superior officers:

1. Directly supervising all tests and studies entrusted to him.
2. Issuing necessary instruction to subordinate technical staff.
3. Checking the readings and test results recorded by the subordinate staff and maintaining the register of test results.
4. Prepare report, on tests and studies after holding discussion with the Deputy Director and Joint Director.
5. Assisting the Joint Director in Publishing Technical Magazine
6. Controlling the work of subordinate technical staff entrusted with the tests and studies.
7. The proper conduct of all works assigned to him.
8. Recording measurements and assisting in check measurements.
9. Watching the progress of works and taking steps to remove bottlenecks if any.
10. Ensuring the accuracy of instruments like testing equipments, weighing balances, tapes etc., by frequent checks and adjustments.
11. Maintaining and submitting proper accounts for the receipts, issues and balances of different articles as per rule.
12. Inspecting the different stores to detect articles that are deteriorated likely to get deteriorated and arrange the disposal of the same as per rule.
13. Assist in arranging research oriented tests and studies.
14. He shall be the custodian of all Tools & Plants under his section.
15. Any other duties entrusted to him by the superior officer.

204.7.6 Research Assistant (KHRI)

He shall be responsible for the following, as instructed by the superior officers: The First Grade Overseer posted as a Research Assistant (Kerala Highway Research Institute) shall, in addition to the duties as per section 203.12, whichever is applicable, be responsible for :

1. Conducting tests and field studies as per directions issued by superior officer.
2. Making necessary arrangements for conducting field studies and tests.
3. Conveying the equipment required for field test or study to the site.
4. Recording properly all readings taken during the tests and studies in a register.
5. Bringing to notice of his superior officers, any difficulty or assistance required during a test or study.
6. Maintaining files and preparing draft letters and notes as directed by his superior officers.
7. Keeping in safe custody all the registers and files relating to works dealt by him.
8. Preparing required drawings relating to studies conducted.
9. Keeping in safe custody all testing equipments and its accessories during the conduct of work.
10. Assisting in preparing and checking detailed estimates for works and submit notes for issuing Technical Sanction, for forwarding to higher offices.
11. Assisting in inviting tender, preparing tender schedule, tender acceptance, executing agreement for works, passing bills and making payments and submitting notes for issuing orders.
12. Co-ordinate the work of subordinate overseers.
13. Assisting the superior officers in all matters entrusted to him.

204.7.7 Other Technical / Administrative Subordinates

Other Technical Subordinates posted in the Kerala Highway Research Institute shall have the following duties, as instructed by the superior officers

1. Assist the First Grade Overseer and superior officers in conducting tests and studies.
2. Prepare necessary drawings required.
3. Assist in office work.
4. Assist the First Grade Overseer in conveying the equipments to site.
5. Keep under safe custody all equipments and accessories entrusted to him at a site or office by the first grade overseer or superior officers.
6. Any other duties assigned by the superior officers.

204.8 Director, Road Safety Cell

1. He shall be controlling Central Road Safety Cell and in addition to duties as per section 202.6 he shall
2. Coordinate the activities of the Cell
3. Maintain and implement road safety policy and procedures

4. Conduct road safety audit
5. Inspect the road signs and markings and ensure that these are adequate and properly placed and conform to the standards.
6. Direct the field officers regarding road safety measures.
7. Coordinate with other agencies like traffic police, trauma care centers and motor vehicles department

204.8.1 Assistant Executive Engineer, Road Safety Cell

In addition to the general responsibilities of Assistant Executive Engineer, as per section 202.8, he shall also be responsible for:

1. Managing the collection of accident data, speed data and other related data and the analysis and preparation of reports.
2. Identification of accident black spot and design remedial measures for accident prevention.
3. Coordinate with Road Safety Authority, PWD Divisions and the Police regarding road safety measures.
4. Preparation of Bill of Quantities and contract documents in respect of works under Road Safety Cell, if required.
5. Plan and conduct road safety audits
6. Preparing Road Safety Manuals, annual road safety engineering programs including modifications.
7. Provide training to the PWD officers on road safety matters in co-ordination with HRD Cell.
8. Assisting in procuring consultancy services on road safety issues.
9. Assisting in maintaining an accident database in the Division.
10. Assisting in developing an asset management system of traffic control devices.
11. Preparation of annual budgets for road safety activities.
12. Checking reports on progress of road safety works in the Divisions.
13. Arrange seminars/workshops on road safety engineering and awareness.
14. Any other duties assigned to him by the superior officer.

204.8.2 Assistant Engineer, Road Safety Cell

He shall assist the Assistant Executive Engineer, Road Safety Cell, in all activities as per section 202.10

204.9 Executive Engineer, IT

In addition to duties as specified in section 202.6 he shall supervise the works of Assistant Executive Engineers under the control of IT initiatives, ISAP and NABARD, FMS and WINGS. He shall also be responsible for the following.

1. The administration and upkeep of all PWD RMMS and GIS throughout the State to ensure that their operations support the Government of Kerala's aim of providing smooth, safe and cost effective roads.
2. Set the administrative controls and level of access approvals to the RMMS and GIS for all staff of the PWD.
3. Prepare supporting information, including GIS mapping showing easily identifiable options for the Chief Engineer to support approval for the annual road maintenance program and contract procurement.
4. Prepare GIS outputs or queries as considered necessary or as requested by the Chief Engineer (A&D).

204.9.1 Assistant Executive Engineer, IT

In addition to the duties as specified in section 202.8, he shall also have the following duties

1. Be the overall charge of WINGS and FMS.
2. Arrange publishing of tender notice for all PWD works.
3. Collect government orders, circulars etc. for publishing in the Intranet /Extranet as per norms.
4. Publish specification on details to ensure the efficient use of road cutting protocol.
5. Coordinate with all the other IT initiatives.
6. Assist to provide IT facilities to all PWD offices in the state.
7. Issue of user ID for departmental officials and other authorized personnel for accessing Intranet/ Extranet of PWD portal.
8. Arrange publication of details pertaining to the RTI Act received from State Information Officers.
9. Any other duties assigned by his superior officers.

204.9.2 Assistant Engineer, IT

In addition to duties as specified in section 202.10, he shall assist the Assistant Executive Engineer, IT.

204.9.3 Assistant Executive Engineer, RMMS

In addition to duties as specified in section 202.8, he shall assist the Executive Engineer, IT, for the following.

1. The administration and upkeep of RMMS throughout the State to ensure prepare adequate road maintenance budget to meet the required level of service for the road user.
2. Ensure that PWD offices in each district, conducts road condition survey on time.
3. Co-ordinate with the Assistant Executive Engineer, GIS, in checking the accuracy of the road data received from the districts.
4. Train all staff in the proper understanding and use of the Road Maintenance Management System in co-ordination with HRD Cell.
5. Preparation of the Annual Maintenance Program for the entire PWD road network and propose distribution of funds for routine maintenance activities.
6. Collect information from the field offices on major disasters like flood damages, collapse of bridges etc. and furnish reports to higher authorities.
7. Co-ordinate with the Assistant Executive Engineer, RMMS, in each district, to set procedures and timings to ensure that the annual road maintenance program is prepared to meet the required budget schedule;
8. Recommend changes to maintenance procedures and techniques for more effective and cost effective maintenance.
9. Any other duties assigned by his superior officers.

204.9.4 Assistant Engineer, RMMS

In addition to duties as specified in section 202.10, he shall assist the Assistant Executive Engineer, RMMS, in all the activities.

204.9.5 Assistant Executive Engineer, GIS

In addition to duties as specified in section 202.8, he shall assist the Executive Engineer, IT, for :

1. The GIS operations within PWD.
2. Giving directions to Assistant Engineers of the GIS unit.
3. Coordinate the GIS operations with the other Assistant Executive Engineers for RMMS, FMS / WINGS.
4. Coordination with HRD Cell for GIS training.
5. Any other duties assigned by his superior officers.

204.9.6 Assistant Engineer, Central GIS Unit

In addition to duties as specified in section 202.10, he shall assist the Assistant Executive Engineer, GIS, for the following.

1. To prepare and monitor actual work plans of the GIS unit and to ensure the timely execution of standard procedures.
2. To supervise and monitor the technical activities like data integration, performance analysis and map preparation.
3. To update the database of GIS and to keep the overall data quality for a sustainable operation of the GIS.
4. Collaborate and harmonize the technical aspects with other IT activities such as RMMS, FMS and WINGS.
5. Perform all technical working steps as per operation manual.
6. Any other duties assigned by his superior officers.

204.9.7 Technicians/ Overseer, Central GIS Unit / RMMS

The duties of technicians shall be the following.

1. Supervise technical operations.
2. Under the control of actual technical performances, such as integration of spatial and attribute data, retrieval and analysis of data, code assignment, preparation and taking print outs of maps etc.
3. Specific tasks assigned, based on their preferences and specifications.
4. Interact with other IT operations, especially with the operators of the RMMS database.
5. Any other duties assigned by his superior officers.

204.10 Executive Engineer (Legal & Social)

1. He shall assist the Deputy Chief Engineer (Planning and Monitoring) and in addition to the duties as per section 202.6 shall be responsible to:
2. Provide legal representation for the department in the Courts of Law and to take follow up action in legal cases involving Department, monitor progress of the ongoing litigations and prepare monthly progress reports.

3. Prepare legal documents relating to land acquisition, employees' service matters and contracts.
4. Advise the field officers in legal matters particularly in respect of land acquisition cases.
5. Prepare instructions/notices & circulars explaining changes to legal issues that affect PWD.
6. Develop, maintain and update a database on legal clauses, litigation, and judgements etc. that are relevant to the Department.
7. Arrange training of junior officers/Assistant Engineers in legal matters, which are most relevant to PWD on a regular basis at the PWD Training Centre.
8. To provide expert opinion to the authorities for settlement of legal claims put forward by the officers and employees.
9. To act as a defending lawyer on behalf of PWD at time of arbitration.
10. To assist PWD in all related matters.

204.10.1 Assistant Executive Engineer (Legal and Social)

He shall assist the Executive Engineer (Legal & Social) In addition to the duties as per section 202.8, he shall:

1. Develop the detailed criteria and guidelines to be employed by PWD to enforce the Highway Protection Act
2. Co-ordinate with PWD offices, police, and other departments as necessary, to implement enforcement of the Highway Protection Act;
3. Act as the PWD co-ordinator for the Working Group set up to manage the utility authority access to PWD Right of Way;
4. Liaise with the Assistant Executive Engineer (Policy Guidelines) to ensure appropriate legal input and suggest modification of PWD policies
5. Prepare drafts on engineering aspects related to land acquisition, rehabilitation and re-settlement.
6. Assist the Executive Engineer (Legal & Social) in the following issues:
 - (i) Develop, maintain and update a database on judgements, litigation, legal clauses etc
 - (ii) Legal matter of field offices, particularly in land acquisition cases and Highway Act.
 - (iii) In arbitration matters.

205 Chief Architect

The Chief Architect shall be responsible for the efficient functioning of the Architectural wing of the PWD. His responsibility shall include:

1. Advise Chief Engineer, Buildings, on selection of site and approval of master plans and layouts and approve Architectural concepts of projects above Rs.500 lakhs.
2. Issuing instructions and guidance to subordinates for the preparation of master plans, layouts, preparation of plans, sections, elevations and interior layout of building to suit the requirements, preparation of detailed drawings and specifications of various components of buildings.
3. Advise and recommend for approval of the plans, sections elevations etc., of buildings after verification.
4. Finalising type designs for various types of buildings commonly in use, for revising existing type designs from time to time.
5. Suggesting detailed specifications for items generally involved in building construction which are not included in the detailed standard specifications of the department.
6. Inspection of major building works during construction, if requested and giving instructions to field officers regarding various features of the work under intimation to the Chief Engineer, Buildings.
7. Distributing the work in his branch to various subordinate officers, giving guidance to them in the manner in which work has to be done and controlling their work.
8. Approving of service drawings for building utilities such as electrical, water supply, sewerage, fire, rainwater harvesting etc.
9. To attend duties specifically assigned by Govt. from time to time.

205.1 Deputy Chief Architect

The Deputy Chief Architect shall assist the Chief Architect in all matters and shall have concurrent responsibilities as that of the Chief Architect and approve Architectural concepts of projects above Rs.200 - 500 lakhs

205.1.2 Senior Architect

He shall be responsible for the following, as instructed by the superior officers:

1. Directing the preparation of master plans, layouts, preparation of plans, sections, elevations interior layout of building to suit the requirements, preparation of detailed drawings and specifications of various components of buildings and approve Architectural concepts of drawings upto Rs. 200 lakhs, Supervise and guide Architectural concepts of projects between 200 lakhs and 500 lakhs.
2. Scrutiny of plans, sections, elevations etc. of buildings

3. Preparation of type designs for various buildings commonly in use, and revising existing type designs from time to time.
4. Preparation of working drawings and detailed specifications for items generally involved in building construction, which are not included in the detailed standard specifications of the department
5. Working out designs of components, which are vulnerable.
6. Inspection of building works during construction if required with the consent of the Chief Architect in co-ordination with the field engineers of PWD
7. Giving directions and guidance to subordinate officers in the manner in which work has to be done, and controlling their work.
8. Assisting his superior officers in all matters entrusted to him.
9. Review of service drawings for building utilities such as electrical, water supply, sewerage, fire, rainwater harvesting etc.

205.1.3 Deputy Architect / Technical Assistant (Architect) / Land Scene Architect

He shall be responsible for the following, as instructed by the superior officers:

1. He shall be responsible for assisting the senior architect in the preparation of master plans, detailed working drawings, specifications etc. with regard to any project assigned to him.
2. Assisting the senior architect in the preparation of Architectural Designs of building projects and preparation of detailed working drawings.
3. The scrutiny of architectural drawings keeping in view of the structural stability of various component parts.
4. Working out designs of various components, which are vulnerable due to restricted size on account of architectural or other considerations.
5. Guiding and controlling the work of subordinate staff.
6. Assisting his superior officers in all matters entrusted to him..
7. Checking of service drawings for building utilities such as electrical, water supply, sewerage, fire, rainwater harvesting etc.

205.1.4 Architectural Assistant

He shall be responsible for the following, as instructed by the superior officers:

1. The preparation of detailed working drawings and scrutiny of the drawings prepared by the Draughtsman.
2. Preparation of specifications of special items based on instruction from Senior Architect or Deputy Architect.
3. Assisting his superior officers in all matters entrusted to him.
4. Scrutinizing of the service drawings for building utilities such as electrical, water supply, sewage, fire safety, rain water harvesting etc.
5. Assisting his superior officers in all matters entrusted to him.

205.1.5 Architectural Draughtsman (Grade I & II)

He shall be responsible for the following, as instructed by the superior officers:

1. Preparation of drawings based on instructions given to him by higher Officers.
2. Preparation of tracings of drawings.
3. Plotting survey work, reducing and plotting level sections etc. based on field data furnished to him marking contours in survey drawings.
4. Checking plotted sections and surveys received from field offices with field book.
5. Preparing of service drawings for building utilities such as electrical, water supply, sewerage, fire safety, rainwater harvesting etc.
6. Assisting his superior officers in all matters entrusted to him.

205.1.6 Artist

He shall carry out any work that may be specifically assigned to him by his superior officer.

205.1.7 Modeler

He shall carry out any work that may be specifically assigned to him by his Superior Officers.

205.1.8 Tracer.

1. Assisting his superior officers in all matters entrusted to him.
2. Preparation of drawings based on instructions given to him by higher Officers.
3. Preparation of tracings of drawings.
4. Plotting survey work, reducing and plotting level sections etc. based on field data furnished to him marking contours in survey drawings

205.1.9. Blue printer.

1. Shall carry out any work that may be specifically assigned to him by his Superior Officers.
2. Taking ammonia prints/blue prints of the drawings and fold it in prescribed manner

206 Buildings Wing**206.1 Chief Engineer, Buildings**

In addition to the duties as per section 202.1, he shall also have the following duties

1. Accord TS to all the building works under his control as per delegation of powers
2. Submission of utilization certificate to the Government in the case of Centrally Sponsored Schemes.
3. Submit annual administration report of buildings to Government.
4. To attend to the duties specifically assigned by the Government from time to time.
5. Shall be responsible for planning, monitoring and budgeting.

206.1.1 Deputy Chief Engineer, Buildings

The Superintending engineer posted in Chief Engineers office is designated as Deputy Chief Engineer (buildings) and he shall assist Chief engineer in all official matters.

206.1.2 Executive Engineer (Planning), Buildings

In addition to the duties as per section 202.6 he shall assist Deputy Chief Engineer, planning and monitoring, in the following:

1. Coordinating with State Planning Department and other departments within the government.
2. Preparing annual plan, 5-years development plan and 20 year Master Plan for entire State.
3. Review of PWD activities and preparation of annual Administration reports
4. Review of proposals for foreign aided projects/aid-worthy projects.
5. Review drafts of Pre Feasibility Report (PFR), Feasibility Report (FR) and Detailed Project Report (DPR) in accordance with field requirements, increased work load and adjustment of price escalation etc.
6. Preparing technical reports, briefing superior officers regarding progress of works lapses, remedial measures etc.
7. Issue directions for the revision of Schedule of rates and revision of standard data book
8. Maintaining a database of various Indian and International codes for use in the department in coordination with the Assistant Executive Engineer (Policy Guidelines).
9. Collect progress report of all works including externally aided works and finance commission works and consolidate the progress report in every month.
10. All other duties assigned by the Deputy Chief Engineer.

206.1.3 Assistant Executive Engineer (Planning), Buildings

In addition to the duties as per section 202.8, he shall assist the Executive Engineer (Planning – Buildings) in the following:

1. Coordinating with state planning department and other departments within the government.
2. Review of activities and preparation of annual Administration reports
3. Prepare drafts of Pre feasibility report (PFR), Feasibility Report(FR) and Detailed Project Report(DPR)
4. Preparing annual plan, 5-years development plan and 20 year Master Plan for entire state.
5. Preparing draft proposals for foreign aided projects/aid-worthy projects.
6. Prepare revised drafts of Pre Feasibility Report (PFR), Feasibility Report (FR) and Detailed Project Report (DPR) in accordance with field requirements, increased work and adjustment of price escalation etc.
7. Preparing technical reports, briefing superior officers regarding progress of works lapses, remedial measures etc.
8. To examine proposals for buildings from the general public, MLAs , MPs etc.
9. Ensure that the details (environmental, re-settlement, feasibility etc.) required for Feasibility Report and Detailed Project Report are obtained.
10. The revision of Schedule of Rates and revision of standard data book.
11. Review of items to ensure uniformity and review of adequacy of budget provisions..
12. Review of performance consistency of contractors throughout the State.
13. Review of proposals from divisions for allotment of maintenance funds under different subheads considering defined program and budgetary constraints.
14. Any other duties assigned to him by the superior officer.

206.1.4 Assistant Engineer (Planning), Buildings

In addition to the duties as per section 202.10, he shall:

1. Assist the Assistant Executive Engineer (Planning), Buildings, in all the activities
2. Initiate in the preparation of annual administration report.
3. Any other duties assigned to him by the superior officer.

206.2 Superintending Engineer (Judicial Circle)

In addition to duties as per section 202.4, he shall be responsible for:

1. All the works for the judiciary Department.
2. Attend meetings related to construction activities of Judiciary department.

206.3 Superintending Engineer (Buildings)

In addition to duties as per section 202.4 he shall be responsible for the following:

1. Approval of rent as per delegation of powers
2. Valuation of buildings as per delegation of powers
3. Attend meetings relating to building construction activities of various Government Departments.

206.3.1 Executive Engineer, Buildings

In addition to duties as per section 202.6, he shall be responsible for the following:

1. To fix rates for cement, steel, etc. for departmental purchase.
2. Issue of Rent certificate, Non availability certificate, stability certificate etc.
3. Payment of property tax.
4. The source for various construction materials shall be fixed after an inspection of quarries and in consultation with other Executive Engineers of the department in the District. The source so fixed shall be communicated to Chief Engineer A&D once in every 5 years.
5. Make payment to Electronic Works.
6. Issue of salary to the PWD staff deployed to concerned LSGD division.
7. To approve rent calculations as per the guidelines prescribed and to furnish details in the specific proforma and issue of rent certificate as per delegation of powers.
8. Issue of non availability certificate of buildings.
9. Submit SoR revision proposals on line to the Chief Engineer A&D between 1st and 15th February every year.
10. Ensure the cleanliness of Rest House/ TB's/ IB's, if necessary by outsourcing.
11. Any other duties assigned to him by the superior officer.
12. To fix market rate of materials, labour in a Taluk / District in every quarter of a year.

206.3.2 Assistant Executive Engineer, Buildings

In addition to duties as per section 202.9, he shall be responsible for the following.

1. Maintaining standard measurement books as prescribed in rules with regard to items of works regularly required to be done.
2. Verifying information about source and availability of principal construction materials and certifying the conveyance involved.
3. Issue of rent certificate as per delegation of powers.
4. Supervision and check measurement of works under his jurisdiction.
5. Arrange periodical maintenance of buildings and allied works.
6. To verify the final layout of walls, columns and beams of structures.
7. Submit rent calculation beyond his powers for approval direct to the sanctioning authority without routing through proper channel.
8. Ensure the cleanliness of Rest House/ TB's/ IB's, if necessary by outsourcing.
9. Any other duties assigned to him by the superior officer.

206.3.3 Assistant Engineer / Buildings

In addition to the duties as per section 202.9, an Assistant Engineer, under the control of a Buildings Section, shall be responsible for the following:

1. The inspection and issue of Fitness Certificate to school buildings, theatres etc., situated within his jurisdiction.
2. Inspection and furnishing of details necessary for issue of stability certificates of buildings when called upon.
3. Inspection, preparation of plans and collecting required data for the working out of fair rent of buildings when called upon to do so.
4. Inspection and report of the stage of progress of buildings built with financial aid from the Government.
5. To transfer building, including inventory and the electrical installations to the occupying/concerned department
6. Maintenance and upkeep of PWD Rest Houses, Quarters etc.
7. To prepare rent calculations as per the guidelines prescribed and to furnish details in the specific proforma and issue of rent certificate as per delegation of powers.
8. To issue fitness certificate of temporary structures including stage.
9. Ensure the cleanliness of Rest House/ TB's/ IB's, if necessary by outsourcing.
10. To issue sweeping area certificate as per norms.
11. Any other duties assigned to him by the superior officer.

206.3.4 Executive Engineer, Special Buildings

In addition to duties as per section 202.6 he shall be responsible for all works of Kerala House at Delhi, Bombay, Kanyakumari, works outside the state, all major building works in Thiruvananthapuram and any other special works allotted by the Chief Engineer.

206.3.5 Assistant Executive Engineer, Special Buildings

In addition to duties as per section 202.8 he shall be responsible for the following

1. Maintaining standard measurement books as prescribed in rules with regard to items of works regularly required to be done.
2. Supervision and check measurement of major buildings.

206.3.6 Assistant Engineer, Special Buildings

In addition to duties as per section 202.10, an Assistant Engineer under the control of special Buildings Section, shall be responsible for the following

1. Maintaining standard measurement books as prescribed in rules with regard to items of works regularly required to be done.
2. Supervision and measurement of major building works.
3. Arrange periodical maintenance of buildings

206.3.7 Executive Engineer, Legislative Complex

In addition to duties as per section 202.6, he shall be responsible for all construction and maintenance works of Legislative Complex, Thiruvananthapuram.

206.3.8 Assistant Executive Engineer, Legislative complex

In addition to duties as per section 202.8 he shall be responsible for all construction and maintenance works of Legislative complex, Thiruvananthapuram

206.3.9 Assistant Engineer (Legislative complex)

In addition to duties as per section 202.10 he shall be responsible for all construction and maintenance works of Legislative complex, Thiruvananthapuram.

207 Electrical Wing**207.1 Superintending Engineer, Electrical**

1. Assist the Chief Engineer (Buildings) in all matters relating to Electrical works.
2. Inspection of major installations and works, which require his advice and assistance.
3. Issuing inspection notes immediately after inspection.
4. Sanctioning of all estimates and arranging all electrical works within the powers.
5. Scrutinise and accord TS within his powers of sanction to all estimates.
6. Overall control of the work of subordinate officers.
7. Giving sanction for arrangements related VVIP/ VIP visits and Government functions, as per delegation of powers.
8. Exercising overall control over the establishment of the electrical wing.
9. Exercising administrative and financial powers delegated to him.
10. Suggesting and implementing technical innovation in the execution of electrical works.
11. Recommending schedule of rates for different items of works involved for approval of Chief Engineer every year.
12. Examining the quality of different makes of electrical materials and preparing list of approved makes for use in electrical works for the guidance of subordinate officers. If different catalogue numbers/sub sections are available for the same brand, the particular catalogue number/sub section shall be mentioned.
13. Recommending specification for materials and works involved in electrification works for approval by the Chief Engineer.
14. Issuing departmental approval for electrical materials.
15. Issuing Electrical Contractor License / Registration (all categories) and fixing rules and regulations.
16. Examining relevant documents and notes and issuing order on routine matters subject to any general or specific instruction of the Chief Engineer.
17. Examining relevant documents and notes and recommending actions in cases requiring Chief Engineer's attention.
18. To approve and finalise an electrical design and drawings.
19. Conduct inspection for approval to workshops / factories where electrical panel, materials are manufactured.
20. To implement energy conservation methods.
21. To participate in all State level meeting where electrical matters are involved.

207.2 Executive engineer Electrical-Design

1. He shall possess a degree in Electrical engineering and his duties shall include
2. Scrutinizing of all electrical design and drawing and submitting to Superintending Engineer electrical for approval
3. Conducting site inspection and discussion with officials of user department , assessing the requirements, incorporating any omissions ,taking into consideration the future load for finalizing the design and drawings and submitting to superintending Engineer electrical
4. Overall administrative and technical control of the electrical lab
5. Conducting necessary test with support of sub-ordinate technical staff to determine the quality of various electrical materials
6. Conducting/supervising necessary tests within /outside the lab if such facility is not available in the lab for giving approval to electrical materials
7. Issuing certificates for the materials tested
8. Recommending quality control measures in electrical works and conducting inspection to work sites if necessary
9. Preparing inspection notes and submitting to Superintending Engineer electrical
10. Conduct training to the officials of PWD electrical wing
11. Keeping in safe custody the samples of electrical materials approved by the superintending engineer electrical till the next renewal and producing when necessary. He shall compare the samples in case of dispute and conduct random checking whether the supplied materials are in conformity with the standards and samples produced
12. shall be responsible for any other matters concerning electrical design, drawing, quality control and testing assigned to him by the Superintending Engineer electrical

207.2.1 Executive Engineer, Electrical

In addition to the duties as per 202.6 whichever is applicable, he shall be responsible for

1. Preparation of specification of materials and items involved in electrification works for recommending to superintending Engineer electrical and keeping the specifications upto date
2. Verifying the quality of different make of materials
3. Assist the Superintending Engineer in conducting inspections for issue of approvals/registration of contractors if required and preparing inspection notes
4. Inspecting at least 5 major works in every district subject to a minimum of 50 works in a year.
5. Inspection of electrical installations, at least 2 major installations in every sub division in a year and preparing inspection notes
6. Sanctioning of all estimates and arranging all electrical works within the powers
7. Issuing instructions for preparation of annual Indents for materials, Tools and Plants etc
8. Making payment to Electrical and Electronics works
9. Arranging the issue of timely reminders on technical reference remaining un answered from subordinate officers
10. Representing the department in conferences and meetings concerning electrical works or those which the superintending engineer electrical is unable to be present and taking follow up action after informing the Superintending /Chief engineer
11. Exercising overall technical and administrative control of the sub divisions
12. Distributing the works in the office among the staff working under him and giving them timely instructions
13. Taking initiative in suggesting technical improvements and energy conservation measures to Superintending Engineer electrical
14. Any other duties assigned to him by the superior officers

207.2.2 Assistant Executive Engineer, Electrical

In addition to relevant duties included under 202.8 whichever is applicable he shall be responsible for the following.

1. Checking estimates submitted by the Assistant Engineer.
2. Inspection and holding discussions with concerned officials before finalising the estimates.
3. Inspecting works during execution, exercising quality control, check measuring works, scrutinising bills etc.
4. Forwarding Bills for payments to the concerned Electrical/ Buildings division.
5. To check the arrangements of works related to VIP visits and Governmental functions.
6. Following the instructions received from higher officers from time to time regarding proper execution of the work.
7. Carrying out any other duties that may be specifically assigned to him by superior officers.

8. To represent the department in district wise meeting and conferences concerning electrical matters.

207.2.3 Assistant Engineer, Electrical

The general responsibilities defined for the Assistant Engineer (Civil) as per section 202.10, whichever is applicable will apply to the Assistant Engineer (Electrical) also. In addition, he shall be responsible for:

1. Guiding and controlling of the work of the electrical staff attached to the section.
2. Arranging rectification of defects reported to him by the field staff and restoring supply.
3. Guiding in proper maintenance of installations and safety measures.
4. Periodical testing of installations, noting the test readings and making timely action for rectification of defect, when the test readings are not within the safe limits.
5. Preparing and giving instruction for the preparation of estimates for electrification works and verifying the adequacy in conformity with standards & norms.
6. Inspecting works in progress and giving necessary instructions
7. Arrangement of works related to VVIP visits and Governmental functions.
8. Taking measurements of all works and preparation of bills.
9. Carrying out any and other duties that may be assigned to him by his superior officers.
10. To check measure measurement recorded by the Overseer.

207.2.4 First Grade Overseer, Electrical

His duties shall include:

1. To supervise and record measurement in M. Book all underground works like cable laying, earthing, concealed pipe etc and work within the TS powers of Assistant Engineer.
2. Inspection and verification of inventory register and ensuring that it is maintained properly and entries are made up to date.
3. Overall supervision of the work in the section
4. Arranging shift duty of the staff and allocation of work to subordinates.
5. Maintenance of stores, Tools & Plant.
6. Maintaining MS Accounts.
7. Security of the inventory Register maintained by Second Grade Overseer .
8. Marking of points of works, supervision of works and taking required follow-up action.
9. Periodical inspection of installations.
10. Preparation of Tender Schedule, Tender Documents etc.
11. Collecting details for the preparation of estimates.
12. Keeping watch over the progress of works and reporting to the Assistant Engineer, Electrical, about the same.
13. Checking the quality of materials on arrival at site and at the time of usage on work to see that they comply with specifications.
14. Checking the quality of work under execution and checking whether the work is executed as per agreement condition.
15. In the event of violation of any of the items referred as (11) and (12) above, reporting the matter to Assistant Engineer, Electrical, in writing, then and there.
16. Maintaining work spot order book as per rules and keeping an account of the daily usage of departmental materials on the work.
17. Taking charge of unserviceable or dismantled materials obtained during the execution of work and arranging for their disposal as ordered by higher officers.
18. Keeping account of Tools & Plant, if any, issued to Contractor.
19. Attending shift duty including holidays when posted in generating station/substation.
20. Any other duties that may be assigned to him by his superior officers.

207.2.5 Second Grade Overseer, Electrical

His duties shall include:

1. Inspecting the electrical installations.
2. Collecting details for the preparation of estimates.
3. Preparing estimate for electrical works.
4. Preparing, updating and maintaining inventory register.
5. Attending shift duty including holidays when posted in Generating station/Substation.
6. Any other duties that may be assigned to him by his superior officers.

207.2.6 / Third Grade Overseer / Lineman, Electrical

His duties shall include:

1. Attending to petty repairs such as changing switches, holders, flex wire etc
2. Rectification of defects of OH line
3. Attending to fuse calls, tracing out and locating faults

4. Reporting within 24 hours to the overseer/ Assistant Engineer, the defects in the installation inspected by him
5. Maintaining a diary of works attended
6. Attending works of urgent nature for immediate restoration of supply
7. Collecting details for the preparation of estimates
8. when posted in work site, checking the workmanship and quality
9. Attending shift duty including holidays as assigned by the superiors
10. Assist the FGO/SFO in execution of works and preparation of bills
11. Attending the duty during VIP visits, government functions etc as directed by the Assistant Engineer
12. Any other duties assigned by the superior officers

208 Electronics

208.1 Executive Engineer, Electronics

The Executive Engineer, Electronics, shall be the Technical advisor to the Chief Engineer, Buildings, in the matter of all electronics works. He shall also be responsible for:

1. The technical control of all works connected with the Electronics Wing subject to the overall control of the Chief Engineer, Buildings.
2. The arrangements for VIP visits and other Governmental functions.
3. Examining relevant documents and notes in respect of Electronic works and issuing orders on routine matters subject to any general or special instructions of the Chief Engineer.
4. Suggesting technical improvements in the execution and maintenance of Electronic and IT related works.
5. Inspection of all works under the Electronics Subdivisions like installation of EPABX (Electronic Private Automatic Branch Exchange), Computer & Accessories, LAN (Local Area Network)/ WAN (Wide Area Network), P. A. (Public Address) System, Internal Telephone system, Community listening centre, servicing stations under the various Sections maintained by the Department and sound equipment in buildings.
6. The periodical inspection of all major and important works.
7. The reviewing of stock materials for Electronics Works and arranging supply of requirements wherever necessary.
8. Scrutinise and recommend the estimates to the Chief Engineer, for according TS.
9. Reviewing monthly progress reports regarding works and issue of directions wherever necessary.
10. Any other work not mentioned in the above, relating to the Electronics Wing, assigned by the Chief Engineer or Deputy Chief Engineer.

208.1.2 Assistant Executive Engineer, Electronics

In addition to the duties as per section 202.8, which ever is applicable, he shall be responsible for :

1. Checking estimates for electronic works and conducting site inspections wherever necessary for finalising the estimates.
2. Maintaining and repairing of IT Equipments related to GIS, RMMS, FMS, WINGS.
3. Inspection of works during execution and giving guidance and instructions to subordinates.
4. Maintaining and procuring stores attached to the Subdivision including distribution of requirements for replenishing buffer stocks.
5. Verification of buffer stocks, dismantled materials etc., in the sections under him.
6. Inspection of Community Listening Centres, Servicing Stations, Public Address Installations, other electronic equipments, works and installations like EPABX (Electronic Private Automatic Branch Exchange), Computer & Accessories, LAN (Local Area Network)/ WAN (Wide Area Network) under his jurisdiction.
7. Issuing certificates of un serviceability of Community Listening Sets or other equipments according to rules.
8. Forwarding Bills for payments to the concerned division.
9. Any other duties that may be specifically assigned to him by his superior officers.

208.1.3 Assistant Engineer, Electronics

In addition to the duties as per section 202.10, whichever is applicable, he shall be responsible for :

1. Preparation of estimates relating to electronic works and execution of works.
2. Maintaining and repairing of IT equipments related to GIS, RMMS, FMS, WINGS.
3. Supervise the works during execution and submission of bills.
4. Guiding and controlling the installations, Servicing Stations, Public Address Installations.
5. Guiding and controlling the staff of his section.

6. Inspection of Community Listening Centres and other equipment and installations, according to instructions.
7. Distribution of works among the staff and taking up works himself whenever necessary.
8. Maintenance of buffer stock and tools and plant including procurement of spares and equipments.
9. Preparation and prompt submission of periodicals and MS Accounts.
10. Recommendation of unserviceable radios, audiovisual equipments and accessories for disposal.
11. Assisting the Assistant Executive Engineer in the collection of dues from Panchayats/ other departments / institutions.
12. Assisting in the preparation of estimates for procurement of IT equipments (GIS, RMMS, FMS, WINGS) and spare parts
13. Any other duties assigned to him by his superior officer.
14. Co-ordinate e-governance activities of the department at the district level.

208.1.4 Engineering Assistant

He shall be responsible for the following:

1. Preparation of drawings, supervision of works and taking required for follow up action.
2. Supervision in the installation LAN, EPABX, Public Address System, WAN, Video Conferencing System and other electrical communication systems.
3. Provide support to PWD officers for the smooth implementation of e-governance activities.
4. Maintaining and repairing of computers, printers, and other IT related equipments.
5. Preparation of tender schedules, tender documents etc
6. Keeping watch over the progress of works and reporting to the Assistant Engineer (Electronics)
7. Checking the quality of materials on arrival at site and up to the time of usage to see they comply with this specifications.
8. Checking the quality of work under execution and checking whether the work is executed as per agreement condition.
9. Taking charge of unserviceable or dismantled materials obtained during execution of works and arranging for disposal as ordered by higher officers.
10. Installation and repair of radio sets and other electronic equipments
11. Assisting the Assistant Engineer in the preparation of records, periodicals, office work, collecting details from field and preparation of estimates and execution of works.
12. Any other duty specifically assigned to him by his superior officers.

209 Roads & Bridges Wing

209.1 Chief Engineer, (R&B)

In addition to the duties as per section 202.1 he shall also have the following duties:

1. Give approval of alignment of roads .
2. Accord Technical Sanction to all road works under his control as per delegation of powers.
3. Sanction investigation estimate for all road works as per delegation of powers
4. To obtain approval of Government for separate estimate for land acquisition and shifting utility services, in case of project
5. Submission of annual administration report to government.
6. allocate the maintenance fund to each Division at the start of the every financial year based on RMMS.
7. Shall ensure that DPR is prepared for all sanctioned projects and arrangement of the project.

209.2 Deputy Chief Engineer, Roads & Bridges

Superintending engineer posted in Chief engineers office shall be designated as Deputy Chief Engineer(Roads)and shall be accountable to the chief engineer in all official matters.

209.2.1 Executive Engineer (Planning - Roads & Bridges)

In addition to the duties as per section 202.6 he shall assist the Deputy Chief Engineer in the following:

1. Review of annual plan, 5-years development plan and 20 year Master Plan for entire state.
2. Review of proposals for externally aided projects.
3. Review of PWD activities and preparation of annual administration report
4. Review of revised draft of Pre Feasibility Report (PFR), Feasibility Report (FR) and Detailed Project Report (DPR) in accordance with field requirements, increased work and cost escalation etc.

He shall also be responsible for the Administration and implementation of the RMMS throughout the State by setting a suitable road maintenance program.

Set procedures and timings to ensure that road condition data is collected in a systematic and sustainable program;

1. Liaise with and direct Executive Engineer in each Division to ensure maintenance activities are undertaken and actioned as required to meet set Government policy and strategies;
2. Set time table and schedules for Division staff for undertaking of regular audits to ensure that the budget and funds as proposed are spent as intended and that the works represent best value for expenditure;
3. Co-ordinate and compile the annual State road maintenance budget requirements for budget submission;
4. Assist the Chief Engineer to finalise and submit the required budget and supporting documentation to Government for approval;
5. Recommend changes to maintenance procedures and techniques for more effective and cost effective maintenance;
6. Prepare reports for reclassification and upgradation of roads for approval by Chief Engineer
7. Report to the Chief Engineer any problems with the annual maintenance program and whether the road maintenance budget is adequate to achieve the set level of service:
8. Overall charge of Road Policy, strategies, its implementation
9. Coordinating with state planning department and other departments within the government.
10. Review of PWD activities and preparation of annual Administration reports
11. Maintaining a database of various Indian and international codes for use in the department in coordination with the Assistant Executive Engineer, Policy Guidelines.
12. Collect progress report of budgetary works, non budgetary works, external financially aided works, NABARD assisted works and Tsunami works and consolidate the progress report in every month.

209.2.2 Assistant Executive Engineer, Planning (Roads & Bridges)

In addition to the duties as per section 202.8, he shall assist the Executive Engineer, Planning (Roads & Bridges) in the following activities

1. Prepare annual plan, 5-years development plan and 20 year Master Plan for entire state.
2. Prepare of proposals for externally aided projects.
3. Review of PWD activities and preparation of annual administration report
4. Prepare revised draft of Pre Feasibility Report (PFR), Feasibility Report (FR) and Detailed Project, Report (DPR) in accordance with field requirements, increased work and cost escalation etc.
5. Preparing technical reports, briefing papers etc for senior engineers.
6. Examine and investigate proposals for roads and bridges from the general public, MLAs , MPs and others.
7. Assist in preparation of reports for reclassification and upgradation of roads for approval by Chief Engineer
8. Ensure whether the reports (environmental, re-settlement, feasibility etc.) required for Feasibility Report and Detailed Project Report are obtained.
9. Review of data to verify uniformity and adequacy of budgets and consistency of contractor performance throughout the State; undertake regular audits.
10. Assist in review of proposals from divisions for allotment of maintenance funds under different subheads in consideration of defined programme and budgetary constraints.
11. Any other duties assigned to him by the superior officer.

209.2.3 Assistant Engineer, Planning (Roads & Bridges)

In addition to the duties as per section 202.10 he shall assist the Assistant Executive Engineer, Planning (Roads & Bridges) in all activities. He shall also assist in the preparation of the administration report.

209.3 Superintending Engineer, (R&B)

In addition to duties as per section 202.4, he shall be responsible for the following:

1. Periodical inspection of sites and review the progress
2. Verification of maintenance registers, road charts, etc.
3. To approve the plugging / seating of well foundation of bridges.
4. Forecast of requirements of bitumen and steps taken to procure them through the division.
5. Review of road traffic statistics and recommendations for reclassification and up gradation of roads.
6. To implement Restoration Protocol.
7. Accord Technical Sanction as per delegation of powers for road, which are under his control.
8. Propose adequate provisions in budget proposal for data collection activities for RMMS/ RBMMS
9. To approve the design of structures within his TS powers.

209.3.1 Executive Engineer, Roads

In addition to duties as per section 202.6, he shall be responsible for the following

1. As the Highway Authority, take suitable steps to evict encroachments as per provisions of Highway protection Act.
2. Requisition for land acquisition
3. Furnish the details of monthly progress achieved in the eviction of encroachments as per Highway Protection Act.
4. Arrange departmental supply of bitumen for works as per requirement.
5. Reimbursement of actual cost of items purchased by contractor for works as per delegation of powers.
6. Ensure compliance to road cutting protocol by co-ordinating with utility agencies and publish the road cutting programme in the web site.
7. Implement the actions proposed by the Road Safety Cell.
8. Ensure that the entire land required for the work has been taken over and is in possession of the department free of encumbrance prior to arrangement of work.
9. Direct the field officers on the implementation of routine maintenance works in accordance with the PWD Road Maintenance Manual.
10. To approve the design of structures within his TS powers.
11. To prepare and approve the annual maintenance programme based on RMMS for the next financial year and to forward the same before end of November as per delegation of powers.
12. To inform the District Collector to take over the land already acquired but no longer required for PWD with the consent of the Chief Engineer.
13. To render all necessary assistance by him or by his subordinate staff to the executive engineer general in the origination of project.

209.3.2 Assistant Executive Engineer, Roads

In addition to the duties as specified in section 202.8, he shall have the following specific duties

1. Assist the Executive Engineer in the implementation of Highway Protection Act.
2. Supervision and check measurement of road works.
3. Implement the Road Safety works as approved from the Central Road Safety Cell.
4. To inspect the toll collection centers and ensure that the toll collection as per regulation.
5. To check the design of structures and drawing for all culverts and minor bridges having single effective span upto 15 metres, within the TS power of Executive Engineer,
6. To assist the Executive Engineer in identifying the land acquired earlier but no longer required.
7. To evict all encroachments with the help of Revenue and Police authorities invoking powers under Land Conservation Act.

209.3.3 Assistant Engineer, Roads

In addition to the duties as specified in section 202.10, he shall have the following specific duties

1. To assist in eviction of encroachment by implementation of Highway Protection Act and Land Conservation Act.
2. Emergency works like removal of fallen trees, earth slips, diverting water from road surfaces etc. shall be and immediately report to the higher authorities.
3. Whenever earthwork quantity exceeds 300 m³, levels shall invariably be taken.
4. To design and prepare the drawing for all culverts and minor bridges having single effective span within the TS powers of Executive Engineer.
5. To maintain registers for all the roads and culverts under his charge in the required proforma.
6. Supervise toll collections within his jurisdiction.
7. Conduct traffic census in co-ordination with RMMS unit.

209.3.4 Executive Engineer, Bridges

In addition to duties as specified in section 202.6, he shall be responsible for the following:

1. Conduct periodic inspection of all bridges under his jurisdiction and furnish inspection reports to the Road Maintenance Unit.
2. Arrange maintenance of all bridges and approaches for a length of 50 m on either side..
3. Coordinate with utility agencies to implement Restoration Protocol.
4. Approve design of structures within his TS powers.
5. Approve the founding level of bridges.
6. Approve the staging & scaffolding of major RCC components.
7. Approve method of Pre-stressing and ensure that the design load is applied in the case of all Pre-stressed Concrete masonry.
8. To render all necessary assistance by him or by his subordinate staff to the executive engineer general in the origination of project

209.3.5 Assistant Executive Engineer, Bridges

In addition to the duties as specified in section 202.8, he shall have the following duties.

1. Supervision and check measurement of bridge works.
2. Arrange maintenance of bridges and approaches for a length of 50m on either side.
3. To conduct periodic inspection of all bridges.
4. Assist the Executive Engineer to coordinate with utility agencies to implement restoration protocol.
5. Supervise concrete pouring of all RCC works.
6. Arrange to prepare design of structures.
7. Recommend the founding level of bridges.
8. Recommend the method of pre stressing and supervise the Pre-stressing procedure.
9. Any other duties assigned by the superior officers.

209.3.6 Assistant Engineer, Bridges

In addition to the duties as specified in section 202.10, he shall have the following duties:

1. Vegetation removal from the structures.
2. Before preparing an estimate for a Bridge work the Assistant Engineer concerned shall personally verify the necessity and adequacy of the various provisions as per approved design.
3. Whenever earthwork quantity exceeds 300 cubic m. levels shall be invariably taken.
4. Conduct periodic inspection of all bridges.
5. Initiate action to coordinate all works.
6. Prepare/Obtain design of structures.
7. Furnish details for finalising the founding level.
8. Adhere to the approved method of pre stressing
9. Scrutinise and forward the staging and scaffolding details obtained from the contractor for approval.
10. Supervise concrete pouring of all concrete works.
11. Any other duties assigned by the superior officers.

210 National Highways Wing**210.1 Chief Engineer, National Highways**

In addition to the duties as per section 202.1, he shall also have the following duties:

1. Initiate actions to get the proposals included in the annual plan.
2. To initiate actions to get the proposals approved from MoRTH.
3. To accord TS to works as per delegation of powers.
4. To allot funds under various heads to the divisions based on the allocation from MoRTH.
5. Submit proposals to MoRTH for declaration as NH.

210.1.1 Deputy Chief Engineer, National Highways

He shall have the duties as per section 202.3

210.2 Superintending Engineer, National Highways

In addition to duties as per section 202.4, he shall be responsible for the following

1. Accord TS to works as per delegation of powers.
2. To approve the plugging/ seating of well foundations of bridges
3. Periodical inspection of sites and review the progress of works.
4. Recommend the proposals to MoRTH.

210.2.1 Executive Engineer, National Highways

In addition to duties as per section 202.6, he shall be responsible for the following

1. Issue of TS to works as per delegation of powers.
2. Monitor and review of all works within his jurisdiction.
3. Ensure eviction of encroachments on the National Highway.
4. Ensure prevention of encroachments on the National Highway.
5. Coordinate with other utility agencies for implementation of restoration protocol for road cutting
6. To move for land acquisition after the proposal has been sanctioned by MoRTH.
7. Any other duties assigned by the superior officers
8. To render all necessary assistance by him or by his subordinate staff to the executive engineer general in the origination of project.

210.2.2 Assistant Executive Engineer, National highways

In addition to duties as per section 202.8, he shall be responsible for the following

1. Supervision and check measurement of works under National Highways.
2. Implement the road safety works.
3. Verify that the toll collections within his jurisdiction are as per regulations in force.
4. To assist in ensuring eviction of encroachments on the National Highway.
5. To submit proposal for land acquisition.

210.2.3 Assistant Engineer, National highways

His duties shall be as per section 202.10

210.2.4 Assistant Executive Engineer, Quality control

In addition to duties as per section 202.8, he shall be responsible for the following.

1. Ensure adherence to quality as per the IRC standards.
2. Submit fortnightly Quality inspection reports of works to Superintending Engineer and concerned divisions.
3. Any other duties assigned by the superior officers.

210.2.5 Assistant Engineer, Quality control

In addition to duties as per section 202.10, he shall assist the Assistant Executive Engineer, Quality Control, in all related activities as per IRC standards.

211 Projects**211.1 Chief Engineer, Projects**

In addition to the duties as per section 202.1, he shall also have the following duties:

1. Manage any specialised projects as per agreement.
2. Assign duties to his subordinate officers to manage Land Acquisition, Social Impacts, Quality Control, Environment, Safety and service procurement as per requirements.
3. Liaison with the external funding agencies for sanctions and payments.
4. Finalise Bid Documents for the project.

211.2 Superintending Engineer, Projects

In addition to the duties as per section 202.4, he shall also have the following duties:

1. Issuing direction and guidance of works as per agreement.
2. Sanctioning bills and recommending for payment.
3. Reviewing Bid Documents for the project.

211.2.1 Executive Engineer, Projects

In addition to the duties as per section 202.6, he shall also have the following duties:

1. Overall supervision of works as per the agreement of KSTP.
2. Timely transmission of bills and recommending for payment.
3. Scrutinizing preparation of Bid Documents for the project.

211.2.2 Assistant Executive Engineer, Projects

In addition to the duties as per section 202.8, he shall also have the following duties:

1. Supervision of works as per the agreement.
2. Timely checking of bills and recommending for payment.
3. Assisting in preparation of Bid Documents for the project.

211.2.3 Assistant Engineer, Projects

In addition to the duties as per section 202.10, he shall also have the following duties:

1. Supervision of works as per the agreement.
2. Timely verifying bills and recommending for payment.
3. Assisting in preparation of Bid Documents for the project.

212 Ministerial**212.1 Administrative Officer**

He shall be under the direct control of Chief Engineer Administration & Designs Administration, and shall be responsible for all administrative matters in general. He shall also be responsible for the following:

1. The establishment matters including transfer and posting of all non-gazetted ministerial staff of PWD.
2. To record opinion about members of the staff in their Confidential Reports, prepare the confidential reports of the Superintendents and Administrative Assistants and submit them direct to the Chief Engineer, Administration & Design.
3. To sanction destruction of old records of the headquarters unit as laid down in the Manual of Office Procedure.
4. To dispose off papers of routine nature.
5. To address Government on routine matters and to communicate with Government on all matters on the lines of the Chief Engineer's orders.
6. To address the Accountant General direct in all matters except in cases where the provisions of the concerned Acts or Rules there under require that the orders and instruments have to be signed by the Chief Engineer himself.
7. To organise and distribute work in the headquarters unit in respect of staff whom he is competent to appoint.

8. To conduct fortnightly review of the "Register of Establishment Audit objections" and to conduct monthly inspection of the "Register of Draft Para".
9. To conduct administrative inspection of all offices in the P.W.D. and forward reports with review thereof to the respective Chief Engineer.
10. To sanction TA bills for December and previous months preferred after March of the succeeding years
11. To sanction pension to all officers, whom he is competent to appoint.
12. To sanction reimbursement of medical expenses subject to rules.
13. To countersign TA bills of non-gazetted officers below the rank of Administrative Officer.
14. To exercise the powers of the Chief Engineer regarding temporary withdrawals from Provident Fund Deposits of subordinates in the Department.
15. To correspond with Public Service Commission, Accountant General and other Heads of Departments and Institutions in routine matters such as making interim correspondence, sending reminders, furnishing information etc.
16. To exercise the powers of the Chief Engineer in the matters of loans, Cycle advance, advance for the purchase of motor car/cycles, mosquito nets etc. according to rules.

212.2 Administrative Assistants

The Administrative Assistant shall assist the Chief Engineer (Administration & Design)/ Superintending Engineer in managing establishment matters. He is also responsible for:

1. Guiding and controlling the work of all ministerial staff in the office to ensure that business rules/Manual of Office Procedure are properly observed.
2. Reviewing the work of the section heads under his control to see that they carry out the work systematically and promptly.
3. Ensuring prompt action being taken on important and urgent matters and where necessary bringing such cases personally to the notice of the Chief Engineer/Deputy Chief Engineer/Superintending Engineer/ Administrative Officer.
4. Examining relevant documents and notes and issuing orders of purely routine matters subject to general or special instructions of Chief Engineer/Deputy Chief Engineer/ Superintending Engineer/ Administrative Officer.
5. Making temporary arrangements for carrying out the work on subordinate ministerial or Class IV officers who may be absent, on leave etc.
6. Maintaining order and discipline in the office, in accordance with instructions of Chief Engineer/Deputy Chief Engineer/ Superintending Engineer/ Administrative Officer.
7. Seeing that registers, books, accounts etc. as per prescribed rules are maintained and kept up-to-date and to checking accuracy of postings at intervals.
8. The safe custody of documents and other valuables entrusted to his care.
9. Scrutinizing files, notes etc. on matters requiring orders of higher authority and putting up such cases promptly with his own remarks.
10. Yearly preparation of list for each categories of staff for transfers and postings according to transfer norms
11. Preparing monthly list of vacant posts in each categories for filling up vacancies by promotion or by posting through PSC or posting through employment exchange
12. Ensuring safe custody of office furniture and maintenance of accounts, thereof.
13. Exercising supervisory control over the custodians of typewriter, Furniture, stationery and other valuables in Chief Engineers Office and circle office.
14. Carrying out any other duties specifically assigned to him by superior officers.

212.3 Administrative Assistant (Treasury)

In addition to the duties as per section 212.2, whichever is applicable, he shall be responsible for :

1. Ensuring timely preparation, encashment and disbursement of pay and allowances of all non gazetted staff and auditing of salary bill / TA bills etc prepared by gazetted officers for its encashment and disbursal in the Chief Engineer's office.
2. He shall be under the control of timely preparation, encashment and disbursement of contingent bills.
3. To maintain proper accounts for all the transactions and submit monthly accounts to the Accountant General.

212.4 Administrative Assistant (Vigilance)

He shall be assisting Chief Engineer, Administration/ Deputy Chief Engineer, Vigilance. In addition to the duties as per section 212.2, whichever is applicable, he shall be responsible for:

1. Processing enquiries regarding allegations raised against any PWD staff, complaints received from the Vigilance Commission, Anti Corruption Bureau, Govt. Officers, and members of Legislative Assembly etc.

2. Assisting verification of records and to see that they are maintained as per PWD Code and Manual.
3. Collection of yearly confidential reports and processing of Confidential Report as directed by Chief Engineer, Administration/ Deputy Chief Engineer, Vigilance.
4. Any other duties assigned to him by the superior officer.

212.5 Senior Superintendents

Senior Superintendent shall be the head of Establishment Branch in accordance with the procedure prescribed in the Manual of Office Procedure and shall assist in the administrative control of the ministerial staff working in that section.

Their responsibility shall include

1. The marking of the papers received in the Establishment Branch to the concerned clerks and ensuring that the papers are duly delivered to the clerks concerned.
2. The scrutiny of the papers and files attended to by the clerks in their section.
3. Putting up notes on matters requiring orders of superior authorities.
4. The scrutiny of personal registers and such other register needed for the prompt business transactions of office in the manner detailed in the Manual of Office procedure and KPWA Code.
5. Receiving tapals and putting up to Deputy Executive Engineer /Executive Engineer /Deputy Chief Engineer.
6. Making alternate arrangements to distribute the works due to the temporary absence of a subordinate employee with the approval of head of office.
7. Ensuring prompt action being taken on urgent matters.
8. Ensuring the orderly arrangements of files, registers etc., by the clerks to enable any file being traced out without much difficulty.
9. Periodically reviewing the old files and records with a view to close them as per rules laid down in the manual of office procedure.
10. Controlling the work of Class IV staff.
11. Carrying out any other duties specially assigned to them by superior officers.

212.6 Junior Superintendents

Junior Superintendent shall be the head of Establishment Branch, if there is no post of Senior Superintendent in an office. Their responsibilities as head of the Establishment Branch shall be the same as that of Senior Superintendent. Their duties shall include

1. Safe custody of chequebooks and preparing cheques on passed bills.
2. Ensuring the safe custody of cash and other valuables and documents entrusted to their care by head of office, proper remittance of cash to the treasury, and maintenance of cashbook and other accounts in the proper form as per rules.
3. The scrutiny of personal registers and such other registers needed for the prompt business transactions of office in the manner detailed in the Manual of Office Procedure and KPWA Code.
4. Scrutinising contractor's bills. This shall include checking arithmetical calculation, checking MAS account, WBO's, Works Abstract, Contractors' Ledger and Checking quantities with schedule provisions.
5. Assisting the Deputy Executive Engineer, in preparation of works budget, and establishment budget performance budget, Revised budget and re-appropriation of funds.
6. Bringing to the notice of the Deputy Executive Engineer /Executive Engineer, power of attorney relating to a work.
7. Maintenance of registers relating to MAS account, Survey Report, Work Abstract and contractors Ledger.
8. Scrutinising survey reports.
9. Overseeing the preparation of monthly accounts.
10. Preparation of schedule of settlement with treasuries.
11. Initiating action on audit notes of Accountant General.
12. Any other work entrusted by his superior officers.

212.7 Head Clerk

He shall be responsible for:

- i. The distribution and scrutiny of the work of each Clerk
- ii. The scrutiny of bills and files attended to by the Clerks, submission of returns on the due dates, maintenance of accounts etc.
- iii. Ensuring that cash deposits other than cash, and other valuables are kept in safe custody and the cash book and other records as prescribed in the rules are properly maintained.
- iv. Disbursing salaries and allowances to the staff
- v. The Head Clerks shall also carryout any other work assigned to them by their superior officers.

A Head Clerk when posted in a Sub Division shall in addition to the above be responsible for:

- vi. Receiving tappals and putting up to the Assistant Engineer (Works), if such an officer is posted or to the Assistant Executive Engineer.
- vii. Safe custody of power of attorney/bank guarantee relating to a work and bringing to the notice of the Assistant Executive Engineer while passing bills.
- viii. Preparing cheques on passed bills.
- ix. Safe custody of furniture of sub division office.
- x. Assisting the Assistant Engineer (Works) and the Assistant Executive Engineer in maintaining order and discipline in office.
- xi. Handing over cash and all other items in his custody on transfer as directed by the Assistant Executive Engineer.
- xii. Assisting the Assistant Executive Engineer and Assistant Engineer (Works) in all matters entrusted to him.

212.8 Upper Division Clerks & Lower Division, Clerical Attender

Clerks shall carryout any or all the ministerial duties involved in the business transactions of the office to which they are attached as prescribed in the Manual of Office Procedure. The actual scope of their work in any office will be decided by the head of the ministerial section with the approval of the head of office or subordinate officer entrusted with the responsibility. Clerks (LD clerks and UD Clerks) in the PWD Office will also function as accountants.

The responsibilities of clerks shall, include:

- i. Maintaining files and registers up-to-date.
- ii. Safe custody of registers, files, papers, documents, books or any other valuables entrusted to their care.
- iii. Putting up papers including correspondence files, connected files, notes etc., for orders of competent authority without delay.
- iv. Bringing to the notice of the superior officer matters that need special attention.
- v. Taking prompt action on unanswered references by issue of timely reminders, putting up draft, Demi Official letters etc.
- vi. Carrying out the accounting work in the office such as checking bills, posting of accounts, maintaining various account registers, compiling returns etc., as prescribed in KPWA Code and other Codes, when posted in the accounts branch.
- vii. Handling and safe custody of cash, timely remittance of cash to Treasury, maintenance and rendering of prescribed account etc., as per rules.
- viii. Carrying out any other duties of a ministerial nature assigned to them by superior officers.

Clerk when posted in a section office shall be responsible for:

- i. Receiving tappals and assisting the Assistant Engineer in all matters entrusted to him.
- ii. Maintaining inward and despatch registers.
- iii. Putting up audit notes for passing bills within powers of the section officer.
- iv. Safe custody of agreements executed for works, deposits other than cash and imprest cash allotted to Assistant Engineer.
- v. Safe custody of power of attorney/bank guarantee relating to a work and bringing to the notice of the Assistant Engineer while passing bills.
- vi. Safe custody of cash received in section office and timely remittance to the treasury.
- vii. Keeping under lock & key, field books and measurement books issued to the section office and maintaining movement register.
- viii. Receiving all cheques issued to the Assistant Engineer
- ix. Disbursing salaries, allowance, advance etc. relating to the staff of section office.
- x. Assisting the section officer in maintaining imprest and other accounts..
- xi. Handing over files, registers, cash, service books and other valuable items in his custody while on transfer as per directions of the Assistant Engineer.
- xii. Preparing draft letters on all matters and putting up for approval of the Assistant Engineer.
- xiii. Posting entries in Service book and keeping the same.

212.9 Confidential Assistant

Duties as per Manual of Office Procedure

212.10 Typist

Duties as per Manual of Office Procedure

212.11 Clerk/Typist

Duties as per Manual of Office Procedure

212.12 Fair Copy Superintendent

Duties as per Manual of Office Procedure

212.13 Driver

Their duties will include:

1. Drive the vehicles carefully within the prescribed speed limits observing all the traffic regulations.
2. Keep the vehicles in road worthy condition. This will include washing and cleaning of vehicles.
3. Check water levels in radiator and battery, oil level in crankcase, fuel level in fuel tank and tyre pressures every day before the vehicle is taken out.
4. Once a fortnight check oil level in gearbox and brake fluid.
5. Report any mechanical fault or damage immediately to controlling officer or the officer in-charge. Attend to routine maintenance as prescribed such as topping up of oil, filling radiator, cleaning of oil and fuel filters, inflating tyres, applying grease where required, etc.
7. When the vehicle is taken out for servicing point out any items needing special attention and be available at the servicing station or work- shop to see that servicing is done properly.
8. When the vehicle is taken for maintenance or for special repairs, assist in the completion of the repairs or carry out such other jobs as are ordered to be done by the officer in charge of the vehicle.
9. In case of accidents the driver shall report the matter to the nearest police station and the officer in charge of the vehicle and abide by instructions of the police in regard to further movement of the vehicle.
10. Be in charge of the tools and spares of the vehicle entrusted to him.
11. Keep account of materials like fuel, lubricating oil etc. entrusted to his care.
12. Maintain log books as prescribed.
13. Take order from the officer in charge of the vehicle in regard to trips to be made, passengers or materials to be carried etc.
14. Intimate in advance the date of renewal of tax, insurance, pollution test, fuel tests etc.
15. They will also carry out any other duties that may be specifically assigned to him by their superior officers.

212.14. Peon:

Duties as per Manual of Office Procedure

213 Finance Wing**213.1 Senior Finance Officer/ Financial Assistant**

The Financial Officer/Financial Assistant is to assist the Chief Engineer (Administration & Design)/Chief Engineer/ Superintending Engineer in exercising financial control in the working of the department/circle. His responsibilities shall include.

- 1 Preparation/scrutiny/finalisation of Budget Estimates for annual plans, 5 year plan and 20 year master plan in accordance with rules in force and orders of the Chief Engineer/ Superintending Engineer. Give remarks on matters mentioned in G.O. (P) No. 388/92/Fin dated 6.5.1992 to the respective Head of Offices.
- 2 They shall be assigned the work relating to
 - a) Distribution, resumption and relocation of funds with the approval of the Head of the Department/Offices.
 - b) Reconciliation of departmental accounts with the figures booked in the Accountant General Office.
 - c) Control over departmental revenue and expenditure with includes:
 - (a) Watching the progress of departmental revenue and expenditure and issuing instruction to the subordinate any likelihood of excess is anticipated.
 - b) Reporting to heads of Department deviations from rules relating to expenditure noticed on the part of subordinate officers..
 - (c) Initiating and dealing with proposals relating to re-appropriations, re-allotments, supplementary Grand and surrender of savings and
 - (d) Scrutinizing expenditure statement relating to plan scheme.
 - (4) Scrutiny of proposals involving enhancement, refund and abandonment of revenue and write off, remission of dues liabilities etc.
 - (5) Deal with inspection reports, audit paras and objections.
 - (6) Conduct annual inspection of offices with the prior approval of the Head of department/Office and submission of notes of such inspection of the perusal and orders of Heads of Office/Department.
 - (7) Issue of instructions to departmental officers regarding
 - (i) Maintenance of accounts and observance of account rules and
 - (ii) Correct accounting of stores and observance of store rules.
 - (8) To arrange the proper maintenance of accounts and connected registers on the loans sanctioned or disbursed except routine loans to Government servants and to watch the prompt recovery of such loans.

3. All files involving financial aspects will be marked to the financial assistants/Finance Officers for their opinion/advice by Head of Departments/Officer or by any mid-level officer who deals with cases.
4. The Head of Department/Offices will normally be guided to the opinion/advice of the Financial Assistants/Finance Officers in the matter involving financial commitment and in case where the advice of Finance Assistant/Finance Officers is not accepted specific reason justifying such as a step will be recorded in the files.
5. The financial Assistants/Finance Officers will also scrutinizing files on:
 - (1) Verification of claims for pension and other retirement benefits.
 - (2) Fixation of pay and allied benefit sanctioned on the basic pay Revision Orders.
 - (3) Proposal involving relaxation of economy orders.
 - (4) Grants/Loans sanctioned by the Department and conduct test audit the accounts of the institutions in receipt of grant aid or loans from Government and furnish utilization certificate.

213.1.1 Divisional Accountants

The Divisional Accountant's main function shall be to assist the Executive Engineer in exercising financial control over the transactions of the Division and in maintaining accounts of the transactions correctly in accordance with rules in force.

The Divisional Accountant is the head of Accounts Branch of the division office. The main duties and responsibilities of the Divisional Accountants are detailed in paras 4.1 & 4.2.1 to 4.2.15 and also in some of the subsequent paragraphs of the KPWA code. His duties shall include:

1. Proper distribution of work in Accounts Branch with the approval of Executive Engineer.
2. Marking of papers received in the Accounts Branch to the concerned clerks in the section.
3. Preparation of budget annual plans, 5-year plan and 20 year master plan, making proposals for re appropriations etc. under instructions from the Executive Engineer.
4. Scrutiny of all papers involving or relating to financial transactions.
5. Scrutinising contractors bill and putting up notes on financial aspects.
6. Bringing to the notice of the Executive Engineer, power of attorney related to a work, while passing bills.
7. Safe custody of agreements and power of attorney for works and to see that registers for the same are maintained.
8. Putting up notes on matters dealt by him for orders of Executive Engineer.
9. Controlling the work of subordinates entrusted with the safe custody of cash, valuables, documents etc.
10. Making temporary arrangements for carrying out the work of the Accounts Branch by suitably distributing the work attended to by a clerk or other subordinate absent, on leave etc.
11. Ensuring prompt action being taken on urgent financial matters.
12. Assist the Executive Engineer in ensuring financial discipline particularly in incurring expenditure within the allotment.
13. Carrying out any other duty assigned to him by the Executive Engineer.
14. When a Divisional Accountant is posted in Stores, he shall, in addition to the above,
 - i. Assist the Stores Officer and Custodian of Stores by maintaining the proper accounts of transactions.
 - ii. Responsible for I.A.P.W.D. adjustments in the District Stores.
 - iii. Responsible for proper accounting and adjustments of firm invoices of maintenance of C.S.S.A. claims.
 - iv. Carrying out any other duties specially assigned to them by superior officers.

214 Miscellaneous

214.1 Stewards, Butlers, Caretakers, Managers or other staff under the control of Rest Houses, Tourist Bungalows etc.

Other staff in direct charge of Rest Houses, Camp Sheds, Tourist Bungalows etc. of the PWD, by whatsoever designation they are called, shall attend to the following duties:-

1. Keep the rooms and premises in a clean and tidy condition. See that rooms are swept at least once every day and also keep the rooms and bathrooms cleaned immediately after the occupant vacates..
2. See that the furniture provided in each room is kept in its proper place and kept daily dusted.
3. See that the bath room and lavatory fittings in every room are functioning satisfactorily, and if any defect is noticed, set right the same locally if it can be arranged and if not report to the Assistant Engineer for urgent action.
4. See that the electrical equipments are kept in good order, fused bulbs replaced etc.

5. In the case of rest houses not provided with running water, see that water required is made available in the bath rooms for occupants.
6. See that bed linen, crockery, cutlery etc. are kept in clean and usable condition.
7. Provide sufficient linen for the use of occupants of each room according to prescribed standards.
8. Where gardens exist see that the garden is watered, trimmed and kept clear of rubbish.
9. Maintain the occupation register and see that every occupant fills up the required columns on arrival and before leaving.
10. Collect the rent due from the occupants and send the collections together with copy of the occupation register to the concerned officer every 15 days or at such intervals as prescribed.
11. Where reservations are ordered by the Collector / Executive Engineer see that the rooms are kept so reserved without being allowed to be occupied. In case there is no reservation by the Collector / Executive Engineer the rooms are to be made available to guests on first come first serve basis with the prior approval of concerned Assistant Executive Engineer/Assistant Engineer. This however is subject to any other reservation made by the Executive Engineer under the control of the bungalow.
12. Keep account of furniture, linen, crockery and cutlery and any other item entrusted to his charge and make periodical checks to see that they are all available.
13. Arrange the washing of linen, bedclothes etc., and keep account of item so arranged to be washed.
14. Where the rest house is provided with catering arrangements, arrange supply of good food as prescribed to the occupants at the approved schedule of rates. This schedule of rates shall also be exhibited in public.
15. Control the work of such subordinates in the rest house as are placed under his charge and report to superior officers cases requiring sanction of appointment of substitutes, institution of disciplinary proceedings etc.
16. See that unnecessary fans, lights & Air Conditioners are switched off at the appropriate time and the use of water and electricity economically controlled without any inconvenience to occupants.
17. Bring to the notice of the Assistant Engineer in charge, all repairs and maintenance required for buildings and installations, without delay.
18. They shall also carry out any other duties that may be specifically assigned to them by their superior officers.

214.2 Drivers of Road Rollers

Their duties shall include: -

1. Drive the road rollers with care and safety observing traffic regulations to the site where rolling work is to be done.
2. Keep the roller in working condition and report to the superior officers defects if any for necessary repair work being arranged.
3. Make a routine check of all the points needing daily inspection such as fuel level in the case of Diesel Engines, water level in the boiler in the case of steam engines, lubricating oil levels and such other features as may be prescribed either generally or for the particular equipment.
4. Carry out the rolling work in the prescribed manner making as many passes as are necessary and are directed to be done.
5. Attend to routine maintenance as prescribed such as topping up of oil applying grease, where required etc.
6. Whenever the rollers are left at roadside after the day's work it is his duty to see that the danger light is put in front of the roller. This is to avert the chances of other vehicles colliding against the roller.
7. When the roller is taken for maintenance or for special repairs, assist in the completion of the repairs or carry out such other jobs as are ordered to be done by the officer under the control of the roller.
8. Be under the control of the tools and spares of the roller entrusted to him.
9. Keep account of materials like fuel, lubricating oil etc. entrusted to his care.
10. Maintain log books as prescribed.
11. Intimate in advance the date of renewal of tax, insurance, pollution test, fuel tests etc.
12. They shall also carry out any other duties that may be specifically assigned to them by their superior officer.

215 Mechanical Wing,

215.1 Assistant Executive Engineer, Mechanical sub-division [Thiruvananthapuram/Mavelikkara/Chalakkudy/ Kozhikkode/ Kannur]

In addition to the duties as per section 202.8 whichever is applicable he shall be responsible for:

1. Testing and issuing fuel consumption certificates of vehicles.

2. Preparation of estimates for repair and maintenance works and issuing essentiality certificates for vehicles of all Government departments and quasi-government institutions.
3. Supervision of works and scrutiny of bills for repairs and maintenance.
4. Maintenance and repairs of all construction equipments of PWD like road rollers, compressors, tar boilers, hot mix plants, etc.
5. Supervision of works for repair and maintenance of refrigerators, HVAC chiller plants, air conditioner set etc.
6. Valuation of vehicles including confiscated vehicles
7. Recommendation for condemnation of vehicles/machineries.
8. Attending the Condemnation Board meetings of Fire Force vehicles.

215.1.1 Assistant Engineer, Mechanical

In addition to the duties as per section 202.10 whichever is applicable he shall assist the concerned Assistant Executive Engineer in all matters.

215.1.2 Assistant Executive Engineer, Mechanical subdivision (Kerala Legislature Complex Construction (KLC) Division, Thiruvananthapuram)

In addition to the duties as per section 202.8 whichever is applicable he shall be responsible for the following:

1. Mechanical related works in the Legislative Complex
2. Erection, commissioning and repair of HVAC chiller plants, lifts, etc.

215.1.3 Assistant Engineer, Mechanical subdivision (Kerala Legislature Complex Construction (KLC) Division,, Thiruvananthapuram)

In addition to the duties as per section 202.10 whichever is applicable he shall assist the Assistant Executive Engineer in all matters.

215.1.4 Assistant Executive Engineer (Mechanical - NH, mechanical subdivision Alappuzha, attached to National Highway Division Alappuzha)

In addition to the duties as per section 202.8 whichever is applicable he shall also be responsible for the following:

1. For the operation, maintenance and repairs of equipments under National Highway wing of the entire state.
2. Testing of fuel consumption of vehicles of National Highway wing of the entire state
3. Maintenance and repairs of vehicles of National Highway wing of the entire state
4. Attending the Inspection Committee for the issue of fitness certificate for road construction equipments of contractors of NH.

215.1.5 Assistant Engineer (Mechanical, NH section- Thrissur, Alappuzha)

In addition to the duties as per section 202.10 whichever is applicable he shall assist the Assistant Executive Engineer in all matters.

216 State Public Information Officer

He shall be responsible to provide information to persons requesting for the same under the Right to Information Act (RTI), 2005. He shall obtain the required information requested from the custodian of information of the office as contemplated under Section 5 of RTI Act, 2005.

216.1 State Assistant Public Information Officer

He shall receive the application from persons requesting for information vide RTI Act and transfer the same to the State Public Information Officer. Also he may receive application under this Act and forward to the State Public Information Officer or senior officer in the Department, as stipulated in Section 5 of RTI Act, 2005.

217 Powers

The powers delegated to the various officers of the department in regard to administration, technical and financial matters are given in appendix (200B). In addition to the above, the following powers must be considered as inherent in the exercise of the duties of each job

Delegated powers shall be used wisely and carefully. It cannot and shall not be a weapon for implementing of work in piece meal evading sanctions from higher authorities. No work may be started before a proper estimate for it has been prepared and sanctioned by the competent authority, unless it is so started strictly in accordance with a special order of Government or some specific codal provisions or departmental rules. The nature and date of sanction shall be clearly recorded in the bills relating to the work. It is the responsibility of the implementing officer and officer who is passing the bills for the work, to see that the respective work is executed under written orders of competent authority. They shall also check and ensure that an Administrative Sanction and Technical Sanction shall precede a tender from competent authority and sufficient funds are provided in the budget for the respective work. In the case of work which is taken up without satisfying these basic conditions all the executing officers and officers

responsible for passing the bills for the work shall be personally held responsible and strict action shall be taken against them. Any loss caused to Government on account of such irresponsible execution of work shall be recovered from those officers who are responsible for execution and passing the bills for the respective work.

SECTION 300

301 Human Resources and Training

The Public Works Department of Kerala employs over 10,000 persons directly and gives employment to over 80,000 persons indirectly. Being a service department, the officers and staff of PWD shall be morally committed to the society and shall uphold the values of the department. This shall be reflected always in the quality of works, integrity and demeanour.

302 HR and Training Cell

This cell shall be under the overall control of the Chief Engineer Administration & Designs who is assisted by the Deputy Chief Engineer Administration & Designs and other officers and staff.

303 Code of Conduct

PWD is committed to a workforce of officers and staff both technical and non-technical that displays the highest standards of integrity and fairness in all aspects of work that enhance departmental and stakeholder trust and confidence. Developing PWD values of innovation, honesty, integrity, respect for people, accountability, teamwork, sharing of knowledge all provide a sound framework from which PWD can build a safe, professional environment for all its employees.

304 Recruitment Process

The requirement in terms of personnel for the effective functioning of the department shall be assessed and reported as per clause 309 "norms for workload assessment" to the Kerala Public Service Commission. The Kerala Public Service Commission carries out all recruitment. . The KPSC has prescribed norms for selection based on the age, qualification, screening tests and interview.

304.1 Induction Process

Each employee in the PWD shall be aware of the obligations and the standards of behaviour that are expected from him. He shall read, understand and comply with the provisions of the Kerala Service Rules, PWD Manual, PWD account code, Manual of Office Procedures and other relevant rules and orders issued from time to time by the competent authority.

An induction programme for orienting the new employees to their new work environment and role shall be conducted; this includes everything from understanding technical role required by the employee, to PWD rules and procedures. An employee handbook shall also be provided for awareness.

305 PIS and ID cards

The personal information of all members of staff shall be entered in to the Personnel Information System (PIS) of the department. Forms duly filled up shall be submitted to HR / Administration office at Head Office or at the circle offices and after updating, the photo identity shall be issued.

All members of staff shall possess the ID card at all times while on duty and shall be displayed/produced on demand. This card should be surrendered in the event of discharge/retirement from service.

306 Probation periods

All newly recruited employees shall be placed on probation and the probation shall be declared as per the relevant provisions of Kerala State and Subordinate Service Rules KSSR.

306.1 Departmental test

Before the declaration of probation, employees, both technical and non-technical, should pass the obligatory tests prescribed for them. The promotion to higher post for each category shall be given only after passing the required departmental tests prescribed for them.

307 Rules

Officers in the respective services are governed by the rules of recruitment, seniority, promotions, etc., applicable to the particular service. Special statutory rules have been issued for certain services and in respect of other services until statutory rules are prescribed, recruitment, seniority, promotion, etc., will be based on executive orders of Government or any other authority delegated by Government to issue such orders

The following rules generally govern the norms of leave, pay, retirement, disciplinary action etc.

- The Kerala Service Rules, Volume I, (Parts I & II),

- The Kerala Service Rules, Volume II, (Part III),
- Special rules of PWD.
- Government Orders issued from time to time on the recommendations of the Pay Revision Commission.
- Government Orders on the revision of pension and other related benefits issued from time to time
- KS&SSR KCS (CC&A) Rules, Kerala Govt. Servants Conduct Rules.

308 Transfers

Transfers and posting of officers in PWD shall be done as per the norms of the government/department issued from time to time. The persons who have undergone training in a field from the department may be given preference in the respective field at the time of transfers and posting.

309 Norms for work load.

The quantum of work handled by the officers in Department may vary from time to time and it is necessary that suitable norms shall be fixed, so that the staff strength of the Department be augmented, reduced or arranged according to requirements. In case of specialised works, new posts/ units shall be created. The HR cell shall assess all such requirements and submit proposals for creation/ deployment/ abolishment of post to the Chief Engineer (Administration & Design).

The government will fix, from time to time, such norms for the various units under the Public Works Department based on the suggestions from the Chief Engineer (Administration & Design).

310 Promotions

Promotions to the posts of AEE and above in the technical cadre and those of A.A in Administrative side shall be done based on the select lists prepared by the Higher Departmental Promotion Committee (DPC-Higher) and the notification issued by Govt. The preparation of select list and other relevant steps for promotion to higher post will be done by the Govt. as per the provisions in the Kerala State Subordinate Service Rules. Promotion to the posts Assistant Engineer , Sr. Superintendant and equivalent posts shall be done by the Chief Engineer (A&D) based on the select list prepared by the DPC. Promotion to the non gazetted posts shall be done by the Chief Engineer (A&D) based on list prepared by Departmental Promotion Committee(DPC-Lower).

At the end of each calendar year, employees who are eligible for promotion to Gazetted posts shall submit the proforma for preparing their annual confidential reports along with a report of self appraisal to the Superior Officer.

311 Disciplinary Actions/ Misconduct

Non-compliance to any of the existing rules shall attract disciplinary actions. Disciplinary proceedings shall be initiated and finalised as per the provisions in the Manual for Disciplinary Proceedings.

312 Cessations and Retirement

Retirement from Government service is at the prescribed age decided by the government. The appointing authority can only accept the resignation of a Government servant after settling the liabilities in respect of the service or post in question.

313 Miscellaneous

313.1 Dress Code

All officers must present themselves in neat and clean attire. Those officers who are required to wear a uniform at work must ensure that this is kept neat and clean.

313.2 Outside employment

No officer will undertake any work for another private or public body or accept fee, without the prior sanction of the Government.

313.3 Confidentiality

All information made available to employees in the course of their employment with the department is to remain highly confidential. An officer shall not issue or make any public statement concerning the public works department's operations or release information on any operational matter.

Employees should also act in accordance to the 'Right to Information Act -2005' which is "An Act to provide for setting out the practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, the constitution of a Central Information Commission and State Information Commissions and for matters connected therewith or incidental thereto."

313.4 Training

Training is an investment made on the human resource of the organization to provide and tone the competencies, required to do an existing job well and also to perform for future needs. Targeted and monitored training can set up an environment of good morale and productivity and contributes in creating a powerhouse of competencies for the public works department.

The department is committed to provide officers with the required training and development so as to enable to perform their work more effectively and develop their skills in line with departmental requirements. Other Human Resource Systems shall support and synergise the training efforts.

Being a technical organization, the focus on skills training shall be based on the day-to-day developments in the field of construction engineering. Training shall be under the control of Human Resources Cell within the Administration wing.

Training shall focus on induction, refreshers training for present employees and specialisation for employees whose responsibilities or duties change through advancement or Departmental transfer

The Deputy Chief Engineer controlling the HR cell will decide the needs of the training under which the personnel have to be undergone. The person thus deputed will help and benefit the Public Works Department as a whole.

313.4.1 Training Functions of HR Cell

- Documenting the key training inputs needed, covering all functions and all categories of staff to upgrade the capability and skills levels to meet the department's objectives in a cost effective manner.
- Formulation of training courses as per the above need.
- Coordinating and finalizing training schedules for the staff.
- Publishing annual training calendar
- Engagement of permanent and temporary faculty for the training courses, as required.
- Implementing training.
- Training feedback- this feedback, along with changes in individual performance needs to be tracked, recorded and reviewed for modification in future programmes.
- Periodic review of training course

313.4.2 Training

Learning, practicing and continuous improvement are the keys for perfecting the skills and the skills and the skills are to be imparted through training from time to time. Graduate fresh from college requires to be thought the departmental procedures. When a person is transferred from one department to a new department he again needs to be given similar training. When a person is posted for a special job he needs to be trained in the job suitably. Certain jobs require some special training involving acquisition of specific skills. During the service period refresher training is essential to brush up and update the knowledge periodically. Though one is expected to try to acquire higher skills with his own initiatives, the organization for its own benefit should have a system of imparting regular training to its work force. It should also be ensured that all the staff gets opportunity to get the training and at the same time it should also be ensured that the training is not intentionally avoided by the staff. A few training programmes can be had from specialized institutes and through attending work shop and seminars.

313.4.3 Orientation Training

Newly appointed staff and staff transferred to roads wing from other wings should be given a training to acquaint themselves about the job requirements. They should be given classroom training on the subject for about two weeks and then they should be attached to some senior staff for getting on the job training for two weeks.

Thereafter he may be posted to the job proper.

In the orientation course following aspects should be covered.

- a) Surveying and investigation
- b) Drawings
- c) Road engineering
- d) Structural components
- e) Drainage
- f) Bridge engineering
- g) Record keeping
- h) Rules and regulations
- i) Testing of materials
- j) Maintenance
- k) Technical Circulars

- l) Do's and don'ts etc

313.4.4 Special Training

When a person has to undertake a specific project and the job requires certain special training in addition to the orientation training, he should be inducted to special training. This type of training is intended to give in – depth knowledge of the subject and increase the capabilities of the person. This training should also include hands on experience and visits to relevant works. The training may comprise following

- a) Flexible pavement design, construction, asphalt mix designing
- b) Bridges, fly-over and sub way structures
- c) Rigid-pavement design, construction, Concrete technology and mix design
- d) New materials PMB, CRMB, FRC, FLY ash
- e) SWD construction and maintenance
- f) Pavement management system
- g) Legal matters and Arbitration

These trainings may be for short duration of three to six days accompanied by visits to relevant works and job experience. Few of these trainings should also be arranged for senior level officers. However for them the duration may be restricted to 2-3 days only.

313.4.5 Refresher Courses

Refresher courses for the field staff brushes their knowledge on the subject periodically and keep them abreast of recent developments in the field. Such courses should be conducted on regular basis and the duration may be about a week or less. Refresher courses may cover the subject in general and latest techniques, machinery, new materials and state of art technology. Every engineering officer at the level of AE and above should attend a refresher course at every five years interval

313.4.6 Resource Development And monitoring

It is expected that every person in the organization should be trained for the job he handles. However, it is generally, experienced that certain persons are inducted for most of the trainings, while certain persons are excluded from the training or they themselves avoid the trainings. In order to ensure that everybody is covered in the training programme a certain monitoring system should be introduced. This system should take in to account the job requirement and trainings under gone, trainings required etc. and should also be able generate list of persons for training or avoidance of training certain persons should be curbed by monitoring. In this regard Railway's monitoring system for training programmes may be referred. At the time of giving promotions due consideration should be given to this aspect. Suitable entry should be made in the confidential report of the employee. At the end of the training some examination should be conducted to assess the knowledge gained by trainee. Candidate failing in the examination should be asked to again under go training.

Training should cover all the staff right from Ministry, Jr Engineer to Senior, officers in the Department. Though orientation training may not be necessary for very senior level officers, special training comprising of modern methods, management skills, legal matters etc. should be arranged for them.

313.4.7 Courses arranged by other organizations

Organizations like NICMAR,IIT, ESC,IAHE, CRRI, IR-rasta etc. arrange special courses for junior and senior level officers. Sufficient number of candidates may be deputed to such courses (annual training calendar is published by these organizations). These organizations also conduct tailor made courses as per the requirements of the client.

Institution of Engineers (IE) , Indian Roads Congress (IRC), Indian National Group of International Association of Bridge and Structural Engineers (ING-IABSE) etc. organize work shops on various road related subjects. Jr. and Sr. officers should be deputed to such work shops.

313.4.8 Seminars

IRC, ING-IABSE, IE, IIBE etc. hold annual seminars at different places. During the seminar papers are presented and discussed on road related subjects, knowledge is exchanged and state of art on the subject is revealed. A good mix of Sr. and Jr. Level delegates can get greatly benefited through such seminars. During such seminars visits to some important on going engineering works and technical exhibitions are also arranged and the delegates can avail these facilities. Similar visits can also be arranged by PWD to the similar works of other organizations.

313.4.9 General

Most of the faculty members are drafted from in-house and retired staff of PWD. It would be desirable that outside faculty members from institutions like IIT, other organizations, professionals and experts in the field are also associated and their expertise is also made use of to get upto date knowledge

in the respective fields. It is suggested that the in-house faculty members should also be given training by sending them to other institutions.

Persons given a specialized training should generally be posted to the job for which he is trained and his knowledge should be used for the benefit of the organization. A person should generally be allowed to work in the same department for a sufficiently long period to gain experience and be useful to the organization. There should also be some incentive for gaining special qualifications (e.g. post graduate degree or diploma) and special skills to the staff.

In general the training schedule may be as follows:

Type of training	Duration	Periodicity	Participation Level
1) Orientation	Two Weeks	At the time of entry and New posting to the Department	New Entrant, Jr and Medium
2) Special	3 to 6 days	When posted to a Project Sp. Programme undertaken	Jr, Medium and Sr.
3) Refresher	3 to 4 days	Every 5 years	Jr. and Medium
4) Courses arranged in other institutions	3 to 7 days	Specialization Desired New developments and Updating the knowledge	Medium and Sr.
5) Workshops and Seminars	2 to 3 days	Interaction with other organizations, State of art in the World	Jr, Medium and Sr.

The detailed syllabus may be got drafted through a committee of consultant's and the respective faculty members can furnish lecture notes to be got printed in a bound volume and supplied to the trainee.

313.5 Road safety

Periodic training on Road Safety shall be given to the concerned field officers. This shall be coordinated with the Central Road Safety cell and the HR cell.

313.6 Environment

Periodic training on environment aspects shall be given to the field officers and also to all PWD officials. The basic environment awareness training will be integrated with the other mainstream programme. In addition stand-alone environmental training shall be conducted on a need basis. This shall be coordinated with the Environment Cell and HR cell.

313.7 Social

Periodic training shall be given on Social Impact Management with emphasis on latest methods and developments in social management and issues on quality of life etc.

313.8 Quality

Periodic training on quality control shall be given to the field officers. This shall be coordinated with the Quality Assurance Cell and the HR cell.

All Assistant Engineers shall be given periodic training in the KHRI laboratory to familiarize with the various tests.

313.9 Training for Management Information System (MIS)

Managing the transition and change from the current systems and process to those with leverage on technology and induction of IT/IS would require significant focus on training in Change Management and enhance the skill levels of the human resources available with the Department.

Training shall be done in-house at training centres that is fully equipped with PCs, required peripherals, and connectivity and with LCD Projector.

The three levels of training shall be:

Basic training	Other specialized training	Training for systems
<ul style="list-style-type: none"> • Use of Personal Computers • Common office automation utilities MS OFFICE (word processing, spreadsheets, presentation systems) • Internet and email • Groupware and workflow • Use of WINGS 	<ul style="list-style-type: none"> • Functional core team training • Technical core team training • Methodology and tools training • Knowledge transfer workshops 	<ul style="list-style-type: none"> • GIS • FMS • RMMS Others (AutoCAD, STAAD, Tally, NISA.....)

313.10 GIS

Periodic training on GIS shall be given to the concerned field officers. This shall be coordinated with the IT Cell (GIS) and the HR cell.

313.11 RMMS

Periodic training on RMMS shall be given to the concerned field officers. This shall be coordinated with the IT Cell (RMMS) and the HR cell.

313.12 FMS

Periodic training on FMS shall be given to the concerned officers. This shall be coordinated with the IT Cell and the HR cell.

313.13 Project Preparation

Periodic training on Project Preparation shall be given to the Assistant Engineers and Assistant Executive Engineers. This shall be coordinated with the PPU and the HR cell.

313.14 Preparation of Budget

Periodic training on preparation of budget shall be given to the Engineers in the Planning Wing. This shall be coordinated with the HR cell.

313.15 Specialisation in concerned Wing

In order to enhance the competencies of the Department, considering recent trends, personnel with specialised qualifications including doctorates in different fields are required in PWD. Facilities for up gradation of qualifications of the Engineers shall be permitted under the Quality Improvement Programme of the Department subject to the general orders and policies of Govt. Those with specialised qualifications and Doctoral qualifications utilising their specialisations in P.W.D. shall be encouraged.

313.16 Budget for Training

The HR cell of PWD shall be in overall charge of all training within PWD. They shall prepare a training schedule for next calendar year. Budget proposal shall be prepared and incorporated in the budget. The budget for specialised training on specific systems shall be included in the concerned wing.

313.17 Monitoring and reporting

The HR Cell of PWD shall maintain record of all the training conducted and the list of attendees.

SECTION 400**Information Technology and Management Information System****401 General**

The chapter deals with the use of Information Technology and Information Systems for enhancing the operational efficiency and building the capacity and capability of PWD.

PWD is currently using the following IT systems.

- a. Web based Information and Governance System (WINGS)
- b. GIS based Road Information System (RIMS)
- c. Road Maintenance Management System (RMMS)
- d. Financial Management system (FMS)

402. Organisation

The use of IT/MIS greatly influences the working environment of the entire organization. The systems, processes and technology have an impact on all the personnel within the Department and those who have an interaction with the Department. As the IT/MIS systems and processes are driven by the operational functions of the Organization, the IT & MIS Project Organization should be broad-based to implement the functional needs of all the operational and support departments.

403. Current Set up

Executive Engineer supervises the IT cell in PWD under the control of Chief Engineer Administration & Designs with the assistance of other officers and supporting staff.

The IT Cell shall be the nodal agency within the Department for all IT/MIS initiatives and would also provide the implementation level support to the respective IT systems. The Executive Engineer shall be the nodal officer of IT cell. Electronics wing shall provide all technical support and function as the working arm of IT cell in all districts.

404 Functions

Key activities of IT cell are

1. Leveraging the tools of IT to promote productivity, communication, transparency, knowledge management and informed decision making in all wings; thus contributing to an image of a proactive, efficient and customer-caring department of Government.
2. Steering the formulation of a dynamic IT strategy and program for the department; and the direction, monitoring and controlling of its implementation
3. Directing the acquisition of appropriate technology platforms, software applications, GIS systems, video and teleconferencing systems, LANs, WANs, and other resources related to the program, including their upkeep, maintenance, expansion, upgradation and renewal.
4. Sourcing the IT related human resources of the department, through in-house sources, to the extent available and through human resource outsourcing as required.
5. Directing IT training and skill upgrading in coordination with the respective wings with a view to creating and maintaining adequate human resources in Information Technology in the Department.
6. Be responsible for data/information integrity and security, back up, disaster recovery, redundancies, prevention of unauthorized access and implementation of appropriate access protocols and policies.
7. Instituting a web portal management board for overseeing the functioning of the PWD web portal.
8. Evangelizing the process of organizational transformation, promoting and imbibing best of class systems and procedures in the department

404.1 Web based Information and Governance System (WINGS)

WINGS is the main information-sharing platform of Public Works Department. Important news and events related to PWD shall be published in the website. Also important government orders, notices and circulars shall be published in the website. Employee related information like transfer and promotion orders shall be published as soon as it is issued. Chief Engineer (Administration & Design) shall form a departmental editorial board for creating contents for publishing in the web site

WINGS, the PWD web portal is segregated for use of public, contractors and the PWD officials with functions restricted to each category and transparency in terms of information as relevant to the activities of PWD.

404.2 Grievance Redressal through WINGS

In WINGS there is a facility for receiving grievance from public. Grievance received through WINGS shall be treated with importance of a tapal and concerned Chief Engineer shall take immediate necessary action thereon. Action taken shall also be intimated to the concerned person.

404.3 E-mail through WINGS

All head of offices up to Division level shall be issued an office email id. Head of office shall make necessary arrangements for regular checking of emails. Important communication may be sent through email with a hard copy filed in the office with send date and time. Official communication received through official email shall be treated as tapal and action taken accordingly.

404.4 Integrated Computerized MIS

The integrated computerized MIS would streamline and improve efficiency of the existing organization and facilitate better planning and management of the departmental resources through decisions that emerge from timely flow of information at all decision making levels.

- Comprehensive data capturing through distributed data acquisition at the Divisional / Sub-Divisional level
- Dissemination of processed information to all categories of users

RMMS, GIS, FMS and traffic information, quality control system, road safety and accident information system, HR cell, shall all contribute to the MIS

The Detailed function of the FMS is detailed in section 500. GIS and RMMS functions are given in sections 800 and 900 respectively.

405 Duties

The duties of all the PWD officers regarding the IT systems and MIS are given in section 200.

406. Maintenance

Maintenance and upkeep of all the IT initiatives ranging from telecommunications/ network management to application development and data center management and processing of PWD shall be through the IT Cell/Electronics wing either through AMC or utilising the services of the Consultants in the relevant field.

Considering the security, measures for network security including Firewalls Intrusion Detection System; antivirus/anti vandal software to protect the servers and desktops is important and hence regularly monitored.

407 Monitoring and Reporting

The Chief Engineer (Administration & Design) shall at his discretion invite external consultants from Government/Professional organizations to review the major IT/IS initiatives for their conformance to quality, industrial standards and best practices especially if there is no expertise within the PWD.

Currently activities relating to system operation and management, back up and maintenance, end-user support is outsourced to qualified technical agencies. The IT cell would oversee the activities of the outsource.

408 Applications using IT

PWD shall prepare an IT strategy and shall get the approval of administrative department. The department may develop new applications based on the so framed IT strategy. The Chief Engineer (Administration & Design) shall consult Chief Engineers in developing a PWD specific IT strategy. Every three years, the strategy document may be revised according to the progress achieved. General approach would be to develop centralized databases and distributed access through web technology. PWD shall also make use of developments in Open Source to create system, which is free of perpetual licensing wherever possible.

SECTION 500

Financial Management System (FMS)

501 General

As part of Institutional Strengthening Action Plan (ISAP), various e-governance initiatives are proposed in Public Works Department. Financial Management System (FMS) aims at automation of procedures right from budgeting to payment and encompass automation of PWD Accounts.

501.1 Organizations

To spearhead the implementation activities and to derive maximum benefit from the proposed system, there is a Central FMS unit in Chief Engineer (Administration & Design)'s office, Circle FMS unit under Superintending Engineer and Divisional FMS unit under Executive Engineer. Senior Finance Officer will lead the change process and ensure successful implementation in all the lower level offices

The organization Setup for implementation of FMS is detailed in section 100.

502 Functions of FMS

The functions of the newly formed units are described below

1. The FMS units will closely work with IT Cell and will give all support for implementation in their respective offices.
2. Impart necessary training to the units.
3. The FMS units will acquire necessary knowhow on FMS for the successful implementation.
4. The FMS units will put up necessary proposals to the head of office for stream lining all finance related activities in their respective office to accommodate FMS in the existing procedures.
5. The FMS units will ensure that, FMS is implemented in their office and generates all financial reports to CE's office, AG's office and Government.
6. The respective head of office will identify the personnel who are to be nominated to the FMS unit and will issue orders with name from time to time

503 Central Office

Demand for grant for Public works Department and detailed estimates (Vol-I and Vol-II) shall be entered into the system as soon as the annual budget is passed. The various heads of account operated by PWD are given under Appendix 500A

All Administrative sanctions with list of works for both plan and non-plan shall be entered into FMS /WINGS system as per Appendix 500B & 500C. All works will get a project ID, as and when it is entered in the Project Management module of WINGS. When the work is added through WINGS the project ID will be generated. All offices shall note down the Project ID of each work and the project ID shall be an integral part of all work related registers, reports and communications. This will be used for payment of bills and financial monitoring through FMS. WINGS will use FMS data for project

monitoring and tendering.

The central FMS unit will make sure that all new plan and non plan works are available in the FMS for further processing.

All contractors entered into contract with PWD shall have a contractor ID.

Division Bill register from every Division shall be updated to FMS system

Central FMS unit will prepare all necessary financial reports using this system.

503.1 Circle/ Division FMS unit

503.1.1 Issue of ID to contractors

FMS Unit in Circles and Divisions will issue contractor ID through WINGS as soon as contracts are entered into with PWD.

503.1.1.1 Bill Register: unit will enter necessary details of bill register in to FMS

503.1.1.2 TS Register: All Circles and Divisions will use automated TS register in FMS

503.1.1.3 Agreement Register

All Divisions and Circles will use automated agreement register in FMS

503.1.1.4 Monthly Accounts

FMS units will prepare monthly accounts through FMS

503.2 Monitoring and Reporting

Finance Officer shall be in the control of monitoring and reporting the progress. The introduction of FMS implies the adoption of a completely new instrument for the organization and its integration into daily working procedures thorough organizational changes, work habits and patterns. Progress and benefits shall be monitored and corrective measures undertaken. Suitable indicators for assessing the overall success and status of the FMS implementation shall be developed for evaluation.

503.3 Maintenance

IT Cell shall ensuring smooth operation of infrastructure and related hardware for FMS operation, and the software maintenance and update shall be arranged through annual contracts

503.4 Training

Central FMS unit will conduct regular training to the officers in the Circles and Division units

There are several activities, which should be executed at regular intervals in order to keep a certain level of know-how and to maintain the communication between the different FMS Units:

503.5 Long term

The maintenance and data updating is an ongoing process and may require revision of FMS and IT related database in future.

SECTION 600

601 Planning and Policy

601.1 Introduction

This section focuses on the various policies of the Government in regard to planning of works, budgeting and reporting.

The FMS, GIS and RMMS are tools that shall assist the PWD in all the above activities. Compliance to the various norms regarding Quality, Safety, Environment and Social shall be considered from planning stage onwards.

Section 700, details the planning funding and budgeting procedures, section 800 is on GIS and section 900 on RMMS. Section 1000 deals with the safety aspects section 1100 on Environment management and section 1200 Social Impact Management.

SECTION 700

701. Planning, Budgeting and Funding

The Department has to prepare and submit to Government every year at the appropriate time a detailed account statement of anticipated receipts and expenditure under the different heads for the

succeeding year in the form of Budget proposal. After the budget is sanctioned, the receipts and expenditure have to be watched and controlled and timely steps taken to regularize unavoidable variations from budget provision through re-appropriations, moving for supplemental grant, surrender of surplus funds etc. The method of preparation of the budget, the procedure to be followed in controlling the expenditure and correcting unavoidable variations are detailed in the Budget Manual. The following instructions shall be considered supplemental to the instructions in the Budget Manual and applicable to the Public Works Department.

702 Planning

702.1 Typical planning cycle

1. Review and analysis of current performance against last year/current year targets.
2. Work out further opportunities.
3. Decide on key objectives for the coming year and move or re-establish longer-term planning.
4. Identify and refine the resource requirements based on this review and build a budget.
5. Define the new financial year's targets.
6. Review it regularly on a monthly basis by monitoring performance, reviewing progress and achieving objectives.

702.1.1 5 Year Plan

Based on the long-term plan, 5 year plans for roads sector and building construction shall be prepared with details of implementation by the PWD.

702.1.2 Annual Plan

Annual plans shall be based on the above 5 year plan and shall include programs schedule for maintenance works, continuing works and new works. External aided projects, centrally sponsored schemes, NABARD assisted schemes, finance commission works and other externally assisted works shall be included in the annual plan.

702.2 Budgeting

A budget is a plan to control finances, enables to make confident financial decisions and meet objectives and ensure sufficient money for future projects. It also improves decision-making by foreseeing financial problems before they occur. Creating, monitoring and managing a budget is key to successful implementation of projects by rendering allocation of resources where they are needed.

The annual budget proposal shall be based on the annual plan. Priority shall always be given for the continuing works for its completion on time. Second priority shall be accorded to the periodic maintenance activities on existing structures (Buildings, Roads, and Bridges) and thirdly for completion of delayed/ pending works. The new works shall be planned only after ascertaining the availability of necessary fund flow to the scheme.

To make budgets effective, periodical review and revisions shall be done. This shall aid as an indicator of the revenues and expenditure linked to each activity, moreover it shall provide for the economic, efficient and effective use of resources required to deliver services and ensure that planning processes are integrated with governments overall strategic and financial planning, budget preparation and reporting processes and in accordance with applicable legislation, regulations and policies.

702.2.1 Key steps in drawing up a budget

The budget shall be realistic by use of historical information, i.e. the current annual plan and previous year's administration reports. It shall be based on a on a month-by-month programme and shall include

- Fixed costs - items such as rent, establishment charges, salaries etc.
- Variable costs – electricity, water supply, petrol, fuel payments to works including maintenance of equipments, vehicles and purchase of stationary and other consumables, training costs, books and periodicals etc.
- Capital costs - purchases of equipment, computers, vehicles and cost of works.

The government's overall strategic plan is presented to the Legislative Assembly before budget and the department must prepare proposals that:

- are consistent with the government's strategic plan;
- describe the ministry's core business goals, objectives, strategies, performance measures and targets;
- address the upcoming fiscal years

702.2.2 Preparation and Submission of Budget

The details to be furnished when submitting budget are given in the Budget Manual. All necessary information shall be furnished in the budget estimates submitted by the respective Executive Engineers and other Divisional Officers and the Superintending Engineer and the Chief Engineer concerned shall scrutinize these. They shall then be consolidated including establishment and all other expenditure in the various offices. The Chief Engineers under the control of Buildings, Roads and Bridges branches of the P. W. D. are the Estimating Officers of the Department and they have to collect the budget estimates of all the different branches viz. Roads, Bridges, Projects, Administration, Buildings, electrical, electronic etc.

702. Selection of new works

Buildings: List of new works of buildings under the administrative control of the P. W. D. shall be prepared each year by concerned Executive Engineer and submitted to Chief Engineer (Building) This list shall be sent to Chief Engineer with recommendations of the Superintending Engineer well ahead of the date when budget proposals are to be sent to the Chief Engineer.

In the case of buildings for other departments of the state, the list of new building works to be carried out by the P. W. D. during the concerned budget year shall be prepared and finalized by the departments concerned. This shall then be incorporated in their Part II proposals after consulting the concerned Executive Engineer of the P. W. D. regarding cost and other details. In the case of works where only investigation and preparation of preliminary estimate are completed, the amount as per preliminary estimate can be noted in the column 'estimate amount'. In other cases, where preliminary estimates are yet to be prepared, the District Officer or head of the Department concerned shall furnish sufficiently in advance- the requirements, site proposed etc. to the Executive Engineer concerned in the district, who will assess the rough cost of the work and intimate the same to the concerned department for incorporation in the list of new works. The heads of Departments are required to send these proposals direct to the concerned Administrative Department of the Secretariat with copies of the proposals to the Chief Engineer, Buildings.

704. Roads and Bridges.

The new works to be included under this head may be broadly divided into-

- (i) Improvement, or upgrading of existing roads
- (ii) Strengthening or construction of existing bridges and culverts.
- (iii) Construction of new roads
- (iv) Construction of new bridges and culverts.

The Highway Authority (Executive Engineer) may propose scheme for the above works under (i) to (iv) as per Highway Protection Act Clause 7.

When Panchayat or other local bodies pass resolution to hand over roads to PWD, the concerned Executive Engineer shall submit proposal for such take over as per provisions in the 'Kerala Panchayat Raj Act'. This is required to ensure that the designated road is in conformity with the standard category road.

705. National Highways. For all original works the department shall prepare and submit proposals through the CE (NH) to the Ministry of Transport, Government of India.

In the case of CRF works under National Highways, the selection of new works is drawn up by the Ministry of Transport (Roads wing) of the Government of India on the advice of the State Government. A list of works to be taken up in a year is then communicated by the Government of India to the State Government well in advance so that the State Government may conduct detailed investigation and forward estimates to Government of India in due course.

706. Repairs and maintenance

Expenditure on repairs and maintenance of buildings, roads, bridges, and miscellaneous public improvements are to be classified under respective heads.

The requirements of the Road safety Cell; GIS and RMMS, environment, quality, research, investigation, training and IT shall also be assessed by the Chief Engineer Administration & Designs in the head quarters and Executive Engineer in Divisions and incorporated in the budget proposal.

The RMMS cell in the centre shall collect the road maintenance requirement for the entire state from respective divisions and the total fund requirements shall be incorporated in the annual budget as a planned item.

706.1 Heads of account

The major heads of account operated by PWD is given as Appendix 500A (section 500)

706.2 Budget Allocation

Funds for plan schemes included under the various major heads will have to be provided based on the annual plan allotment for the respective schemes. The annual plan allotment for each of the plan schemes are fixed by the Planning Commission in consultation with the State Government.

In the case of non-plan expenditure such as expenditure under repairs and maintenance or on works which do not pertain to developmental activities, etc., the total allotment under various major, minor or objective heads will be indicated by Government and the total provision under such major, minor or group heads shall be kept within such allotment when framing budget proposals.

The concerned Chief Engineer keeping the following principles in view, shall make having ascertained the total amount available under any major, minor or group head, the distribution of funds to various works.

(a) Sufficient amount shall be provided for works already commenced to enable the same being completed as early as possible. Careful study of the progress which can be achieved during the year shall be made after taking into account availability of land, materials, tools and plant, delays if any due to seasonal conditions or other reasons etc. and the budget provision to be made shall be based on such study by the Executive Engineer.

(b) In respect of new works these shall be listed in the order of priority and the provision of funds for each shall be determined taking into account the progress which can be expected during the year after allowing for delays if any which may occur for getting possession of land, arranging contracts, making available required materials, tools and plant etc. If the total funds required for new works after making provision for each on the lines set out above is found to be more than the total amount available for distribution, then a few works with lesser priority shall be eliminated. It is not advisable to provide for a large number of works with insufficient funds for each.

Provision of funds for repairs of the various categories of public works shall be made based on the principles detailed in the respective chapters on maintenance as indicated below:

(a) Buildings – Section 2900.

(b) Roads and Bridges- section 2700 and 2800 respectively

(c) In other case according to needs based on past experience.

The method of working out funds required under establishment is detailed in Budget Manual. The system of charging the expenditure on work establishment to individual works has now been abolished and the work establishment personnel are also taken over into regular establishment.

The provision in the budget under tools and plant covers-

(a) Purchase of new tools and plant, and (b) Repairs and carriage of existing tools and plant. Provision for (a) is generally made on a L. S. basis for the items to be procured during the year as detailed in chapter 5 of Section V, Asset Management –Movable Assets. Provision for (b) is also made as a lump sum.

There is a minor head 95 provided under major head 3054-80-799 to cover suspense transactions relating to miscellaneous public works advances. All transactions recorded under this head are ultimately removed either by payment or by recovery in cash or by adjustment to the works concerned. The transactions therefore consist of both debits and credits and the latter are adjusted as reduction of expenditure. Although the net financial effect of the transactions may be either zero or a small amount representing the difference between total expenditure and total credits, it is necessary for budget purposes to forecast the likely total expenditure to be incurred during the year without taking into account the credits and provide for the same under this head. This forecasting shall be done based on previous year's experience allowing for necessary variations anticipated.

The budget shall be made public through website after budget speech by the Chief Engineer (Administration & Design).

707. Preparation and Submission of Performance Budget

In addition to the Financial Budget referred to above it is also necessary to prepare and submit a performance budget in respect of the activities of the various branches of the department. This method of budgeting shall enable a department to set out in the budget document the objectives of the department during a year, the programs and activities by which these objectives are proposed to be realized, the expenditure to be incurred on each of these programs and activities during the year, indicating the broad

physical achievements that is possible. This is a useful management tool both for the Legislature and the departments in programming and evaluating the performance of the departments.

Performance Budget for this year and for next year shall be filled up in the prescribed form. Guidelines for filling up the proforma sub activity-wise and object-wise are given therein.

The Executive Engineers of the Divisions shall fill up the proforma and submit to the Chief Engineer and then to the Secretary to Government, Finance Department by 1st December every year under intimation to concerned Chief Engineer.

The Chief Engineers shall submit the proposals for next year's budget in the proforma considering the previous years Performance Budget. At the time of finalizing the budget, the Finance Department will consult the Chief Engineer about revising the physical achievements proposed in the proposals with reference to the final allocation that would be made in the budget against each activity. The Chief Engineers shall issue supplemental instructions, if necessary, on the above subject.

707.1 Control of Expenditure

The Chief Engineer is the chief controlling officer of the major budget heads solely operated by the P. W. D. Each Chief Engineer will function as the chief controlling officer for the major budget heads or portions of major budget heads with which his wing has to deal.

The Superintending Engineers under the control of Circles are subordinate controlling officers to control the expenditure under the budget items dealt by them.

Executive Engineers under the control of Divisions and other Divisional Officers of the P.W.D. are disbursing officers. It is the duty of the concerned Chief Engineer to ensure that resources are collected, allocated and expenditures are disbursed in an efficient, effective and economic manner. He shall hold subordinate officers accountable for spending public money both in terms of outcomes achieved and value for money

The chief controlling officers, the subordinate controlling officers and disbursing officers have to exercise proper control over expenditure in the manner detailed in the Budget Manual. Expenditure has to be watched in terms of each unit of appropriation and steps taken to regularize unavoidable variations as soon as such variation is anticipated. The unit of appropriation so far as budget of the P. W. D. is concerned will be:

- a. For works or items for which specific provisions are made in the budget-each such work or item.
- b. For works or groups of works for which L.S. provision is made- each unit in to which the L.S. is distributed by the chief or subordinate controlling officer. Thus the budget provision for project involving several works may be a L. S. When this is distributed among various works pertaining to the project the expenditure has to be watched against the amount so distributed to each such work.
- c. For repairs and maintenance when specific provision is made for a particular item or structure. - each such item of maintenance.
- d. For repairs and maintenance when the amount is provided as a L. S. -each unit in to which the L. S. is divided by the chief or subordinate controlling officer.
- e. For Tools and Plant -each unit in to which the Chief or Subordinate Controlling Officer distributes the L.S.
- f. T. A. contingencies and other expenses for which L. S. provision is made - Each unit in to which the L. S is divided by the chief or subordinate controlling officer.
- g. Suspense. The provision in the budget is to be treated as the unit of appropriation.
- h. Grant in aid--each unit in to which Government distributes the L. S.

In addition to watching and controlling expenditure against budget grant it is also necessary to watch whether the physical target arrived at for each work is being achieved. The performance budget is useful for effecting this check and Chief Engineer, Superintending Engineer and Executive Engineers shall periodically review the actual progress of each work against the physical targets fixed for the year in the performance budget. Even in cases where there is no performance budget prepared, during the periodical financial review by the Chief Engineer, Superintending Engineer and Executive Engineers the physical progress of each work shall be reviewed and steps taken to remove difficulties in achieving the desired progress. The financial review will also bring to light cases where variations from budget grant are likely so that timely steps can be taken to regularize the same.

Variations are to be regularized through surrender of surplus funds, or by re appropriations or supplemental grant as the case may be. The procedure for the above is detailed in the budget manual.

708. Construction and maintenance of National Highways.

The procedure regarding budgeting and control of expenditure for National Highways is as follows.

Provision for works to be executed in a year is made in the Central Budget under 5054 Capital Outlay on Roads and Bridges, 01-National Highways (Sub-major Head), 01.337 minor head, 01 works under roads wing, 01.02 other scheme and 01.02.53 major works. The Ministry then communicates budget provision and work-war allotment for original works to the State Government at the beginning of each year. Budget proposals showing revised Budget Estimates for the year and Budget Estimates for the next year are to be furnished to Government of India by the State Government by the 15th September every year. Revised allotment is sanctioned based on this.

The power to reappropriate/ modifies allotted funds vests with Government of India. The final requirements of funds are then furnished to Government of India by the end of February, based on which they communicate the final allotment. Expenditure on works is to be strictly limited to the final allotment. Reasons for variations have to be explained in the appropriation accounts furnished to Government of India at the beginning of the succeeding year.

In cases of L A. for National Highway works, the owners of the land may move the Courts for enhanced compensation. If and when the courts award higher compensation, the state Government, which acquires the land on behalf of Government of India becomes a party to the dispute and the excess expenditure incurred in satisfaction of Court decree is a "Charged items" as far as the State Government is concerned. The expenditure is therefore initially to be met by the State Government. Such amounts are ultimately reimbursed by the Central Government from their voted grant during the same year.

Government of India keeps regular control over expenditure on National Highway. To facilitate this, the State Government forwards the monthly statements of expenditure to Government of India by the middle of each succeeding month. For maintenance and repairs of National Highways also, the Government of India prescribe norms and the State execute works on an agency basis as in the case of Original Works. Lump sum allotment for the various kinds of repairs, viz. normal maintenance and repair works, periodic renewals and special flood damage repair works for each year are sanctioned by Government of India separately for each category. For normal maintenance and repairs and periodic renewals abstract estimates are forwarded to the Ministry of Transport on the first of April every year and for special and flood damage repairs they are sent by first June and 15th October respectively. Maintenance and repairs works are done in the cyclic order of priority within the allotment sanctioned from time to time.

709. Funding

709.1 Departmental Revenues

The P.W.D. is responsible for the collection and accounting of certain items of revenue. The main items of revenue are given below:-

- a. Rents. -rents for residential and non-residential buildings and quarters under the control of the P. W. D. including rents of furniture, amounts arising from lease of stalls, fees realised for the use of rooms in rest houses, etc. are credited to the concerned head.
- b. Sale proceeds of usufructs of trees belonging to Government along the sides of roads and on PWD land or lease amounts thereof are credited under the concerned head.
- c. Recoveries of expenditure: Recoveries on account of damage caused by occupants to buildings and furniture, tools and plant charges from contractors, refund of unspent balance of grant, contribution from local bodies or private parties in respect of works, as specified in Article 428 (a) of the K.P.W.A. Code, sale proceeds of old tools and plant, etc. are creditable to the concerned head.
- d. Fee collected by mechanical wing for testing of vehicle for fuel efficiency, preparation of repair estimates, supervision of work etc.
- e. Hire charges for machineries and equipments
- f. Fines and confiscations, etc.
 - g. Miscellaneous: The receipts credited to concerned head are lease rent and sale proceeds of avenue trees, wood, glass, fruits, vegetables, dead stock, waste paper and other items, rents from land etc.

It is the duty of the Executive Engineers and officers subordinate to them to arrange realization of revenue to be collected by them in time and also take all necessary steps to prevent leakage of revenue.

General principles regarding collection of revenue and its accounting procedure are detailed in para 269 to 300 of Public Works Account Code.

710. Procedure for payments from the Central Road Fund. A specific percent of the extra duty of customs and of excise levied on motor spirit shall be used for the purposes of road development and apportioned to the state governments. The conditions to be satisfied are:

1. State has to comply with the Central Government recommendations for regulation and control of motor vehicles.
2. The Central Government may resume the whole or part of any sums which it may at that time hold for expenditure in that State for delay without reasonable cause the application of any portion of the Road Fund allocated or re-allocated as the case may be for expenditure within the State
3. All sums resumed by the Central Government from the account of any State Government as aforesaid shall be re-allocated between the credit accounts of State Governments and the reserve with the Central Government in the ratio of the main allocation for the financial year preceding the year in which the re-allocation is made provided that the sum so calculated as the share of the State from whose account the resumption has been made shall be credited to the reserve with the Central Government.
4. Special additions to the Road Fund for financing particular projects may be accepted from sources other than that already mentioned in Central Road Fund rules, shall be kept in a special reserve and utilized for such projects.
5. The balance to the credit of the Road Fund or of any allocation thereof shall not lapse at the end the financial year.
6. No expenditure shall be incurred from any portion of the Road Fund save as hereinafter provided.
7. The Central reserve with the Central Government shall be applied first to defraying the cost of administering the Road Fund and thereafter upon such schemes for research and intelligence and upon such special enquiries connected with roads and upon special grants-in-aid for such objects connected with road as the Central Government may approve.
8. The sums allocated for expenditure in the States may, subject to the previous approval of the Central Government, to each proposal made, be expended upon any of the following objects, namely: -
 - (i) on the construction of new roads and bridges, of any sort;
 - (ii) on the reconstruction or substantial improvement of existing roads and bridges.
 - (iii) in special cases, on the maintenance of roads and bridges, constructed, reconstructed, or substantially improved from the Road Fund or from loans approved or sanctioned by the Central Government;
 - (iv) to meet charges, including the cost of establishment, connected with the preparation of schemes of road development or with the administration of State Roads of communications;
 - (v) to meet charges including the cost of establishment connected with control of motor transport, and
 - (vi) on the interest and amortization of loans approved or sanctioned before the date of this resolution by the Central Government and spent, or to be spent on the construction, reconstruction or substantial improvement or roads and bridges.
9. In considering proposals for the construction, reconstruction or improvement of roads and bridges from the road fund the Central Government shall have regard to the present urgent need for improving the efficiency and reducing the cost of transport by road or agricultural produce to markets and railways.
10. Provided that the amounts in the Special Reserve shall be applied only to the purposes for which they are earmarked.

710.1. The orders of the Government of India regarding the procedure for payment from the Fund is given in Appendix 700A.

711. Kerala Road Fund Board (KRFB)

As per the provisions of Kerala Road Fund Act, 2001, the Kerala Road Fund Board has been constituted for approving all participation agreements and allocate from the Road Fund subsidies/annuities/other assistance to private participants

As per Notification No. 22098/H1/02/PWD. Dated, 30th May 2003 the Kerala Road Fund Board rules are framed.

The Road Fund shall consist of: -

- (a) all moneys received from the Central Road Fund established under the Central Road Fund Act, 2000
- (b) the contribution made by the State Government
- (c) all fees, fines and other amount collected by the Government as per the provisions of the Kerala Highway Protection Act, 1999

- (d) all payments made by the concessionaire as per the concession agreement;
- (e) all amount standing to the credit of the Bridges Fund established under section 12 of the Kerala Tolls Act, 1976
- (f) the user fees collected by the Government agency or the statutory body under the Kerala Road Fund act Act
- (g) grants or loans or advances made by the Government of India or any institution
- (h) grants or loans or advances made by the Government
- (i) all returns on investments made by the Road Fund Board directly or through a Government agency or statutory body
- (j) any amount borrowed by the Road Fund Board
- (k) any other amount authorised for credit to the Fund under the provisions of Road Fund Act or rules made there under or any other law for the time being in force.
- (l) All fees collected for issue of NOC for Petrol pumps, advertisements, road cutting permit fees.
- (m) Recovery of Centage Charges
- (n) funds for deposit work
- (o) fee for Registration (or renewal) of contractors
- (p) fee for sale of tender
- (q) fee for fitness certificate of buildings
- (r) fee for valuation of buildings
- (s) test fees collected by KHRI
- (t) The Government shall contribute to the Fund every year an amount equal to ten per cent of the tax collected by them in the previous year under the provisions of the Kerala Motor Vehicles Taxation Act, 1976, and the said amount shall be charged on the Consolidated Fund of the State.

712. Centage charges

All state government works shall be done by PWD. However centage charges as per section 1701.4 shall be levied and remitted to KRFB

713. Externally Aided projects

The funds allotted through the budget by the State Government are insufficient for the requirement of the department for their proper functioning. Hence financial assistance from the external funding agencies like NABARD, ADB, WB etc are sought by the state government to cater to the requirement. P.W.D. has also obtained such loans for carrying out necessary roads and bridge works. In the case of works where expenditure is reimbursed, the prescribed proforma duly filled up shall be forwarded to the Finance Department for onward transmission to the funding agency. The expenditure incurred for the purchase of quality control equipments, for setting of labs, purchase of tools and plants and other expenses for the work shall also reimbursed if the same is included in the Administrative sanction of the work.

714. Administration Report

The Chief Engineer (Administration & Design) shall publish annual administration reports. The report shall be based on the budget allocations of the concerned wing. It shall also include records of transactions, accounts and financial statements in accordance with government accounting policies, department service plans that identify goals, objectives, and performance measures. The administration report of each wing shall also include the expenditures including establishment charges incurred from the Head of account of the concerned wing. The details and names of investigation works, architectural drawings and structural designs done during the year shall be incorporated in the administration report of the concerned wing.

The report must disclose information concerning commitment on major project, describe the progress of each project and include project expenditure plan information.

It shall briefly describe-

- the objectives of the project;
- the costs and benefits of the projects;
- the ongoing risks associated with those costs and benefits
- the use of any public/ private partnership arrangement in delivering the project

. The salient points to be included in the Administration report are shown in Appendix 2.5

715. Award of excellence:

Every year the PWD shall award persons/ offices for meritorious service to the department and society. Similarly contractors shall also be suitably rewarded for exceptional performances. For this

purpose a committee headed by the Chief Engineer Administration & Designs with all Chief Engineers and one or two experts shall be constituted every year with the approval of government. The committee shall fix the norms, procedure and criteria. The committee then shall invite applications from the Engineers/Contractors through proper channel by the first week of January and declaration shall be made before 31st of March.

Section 800

801. Geographical Information System (GIS)

801.1. General

GIS is a computer system capable of capturing, storing, analyzing, and displaying geographically referenced information.

PWD GIS has mapped all roads in Kerala State including bridges, junctions, culverts and other objects of interest. It provides a complete and accurate map of the road network in Kerala.

PWD GIS is a tool for planning preliminary alignment ; and development of the road network to improve connectivity and to assist with better decision-making.

An important use of GIS is to enable PWD to develop efficient maintenance strategies for roads and bridges. PWD GIS is the spatial database for the road maintenance management system (RMMS). GIS plots can show roughness, potholes and other criteria, which indicate the road, condition and thus help PWD to arrive at logical decisions. Further, PWD can prepare and monitor annual work plans and maintenance programs.

802. GIS Operation in PWD

The GIS operations in PWD are carried out at two levels, the central GIS unit at **Chief Engineer Administration & Designs** office.

802.1. Functions of Central GIS unit

- Overall database maintenance and responsibility for changes to the GIS database
- Data integration
- Preparation of subsets for each Local GIS Unit in Circles and Divisions
- Analysis and presentations for general management
- Compile, convert and integrate new data layers
- Coordinate spatial data collection for road network and bridge maintenance
- Integrate GPS coordinates into geographical database for regular update
- Prepare and provide digital updates of GIS for Local GIS Units
- Prepare and maintain metadata documentation
- Maintain link to databases for RMMS, GeoKAMS, FMS and WINGS
- Perform analysis and prepare printouts for Chief Engineer
- Perform and present *ad hoc* analysis
- Maintain contact to Local GIS Units
- Carry out GIS introduction as training for new staff of GIS Units
- Prepare and organize regular meetings
- Prepare and organize eventual contact to other departments, institutions, private sector
- Prepare and organize review workshop
- Coordinate and organize future expansion of the GIS
- Monitor progress of GIS implementation
- Provide large sized map printouts to Circles, Divisions, Sub-Divisions and Sections
- Prepare analysis and printouts for respective Circle / Division
- Prepare documentation and analysis results for Central and Circle Level
- Maintenance of the Geographical Database – Field collection of data for database maintenance
- Coordinate GPS field data collection of new roads and bridges for regular maintenance
- Inform Central GIS Unit about changes in road network for re-classification
- Maintain contact to Sub-Divisions and Sections
- Participate in regular meetings
- Provide map printouts to Sub-Divisions and Sections

802.2. Supporting role

The function of Sub-Divisions and Sections is mainly to provide the basis of the attribute database through data collection. They shall also verify the various outputs and keep these maps as reference.

802.3. Data Collection and compilation

The source of all data in PWD is the Section, where it is collected and compiled. The Sub-divisions hold a key function for data compilation since data will be aggregated here. Data validation, computing and data references shall be checked at each level. The key function for GIS and road maintenance management is at the Division level. The data will be assembled and the first analysis is done in order to prepare yearly maintenance programs.

802.4. Data Processing

The table 900.1 gives an overview about the general functions in data processing of the different levels.

Table 900.1 General functions of geographical data processing in PWD administrative levels.

PWD Administrative Level	Major Function in Bottom-up Data Processing / Collection
Sections	Data collection and surveying
Sub-Division	Collection from Sections, first data assembling
Division	Collection from Sub-Divisions, assembling, first analysis and validation (results in maintenance programs and project proposals)
Circle	Collection from Divisions, scrutinizing and eventually proposal for modifications <i>Note: no assembling of data</i>
Central	Collection from Divisions and Circles, analysis and validation (results in budget allocation) Update and maintenance of core database.

803. Information Retrieval

The central unit shall perform all the analysis and output generation functions of GIS including mapping for the Chief office, circle offices and division offices.

The GIS database shall be disabled for changes by the general Divisions but shall have an analytical tool for performing analytical functions and first 'planning level' for maintenance activities.

804. Duties of the PWD GIS Units

The tasks covered by the different GIS Units are basically two fields:

1. Maintenance of the Geographical Database
2. Analytical operations, presentation and communication of information derived from GIS

805. Database Maintenance Procedures

In order to assure sustainability of the GIS initiative, it is crucial to maintain the geographical database and update it regularly. The regular maintenance of the spatial database for PWD refers to the following data:

- Alignment of roads
- Classification of roads
- Location of bridges / cross drainage (CD) structures
- Maintenance and update of registers

805.1 Update of new road alignments:

The major change in the GIS database will be caused by the construction of new roads or eventually the conversion of roads into PWD roads or which have not been captured accidentally. In case of conversion into PWD road, the alignment of those roads has to be captured like a new road.

About 10 to 20 km of new road is constructed yearly in every Division. These new alignments have to be included in the database as update of the road network. Ideally, the respective collection of data shall be done through the use of the Global Positioning System (GPS). Since the maximum accuracy level of the geographical database is at ± 6 m because of the ground resolution of satellite images, a differential correction (DGPS, Differential GPS) of GPS coordinates would not be required, instead, simple hand-held GPS receivers shall be used for the primary data collection for new road alignment. Handheld GPS receivers provide accuracy of about 5-10 m.

The Divisions, i.e. by the GIS Officers of the respective Division, shall coordinate the field surveys for the GPS measurements. The GPS data have then to be forwarded in digital format on CD to the central GIS unit in Trivandrum for integration into the GIS database. The updated version of the GIS database

will be returned to the respective Divisions. The updating of the road network shall be carried out once a year.

805.2. Re-classification of roads

The classification of roads may change because of the conversions. Since the road network in the geographical database contains all roads, regardless of their classification, a new alignment would usually not be necessary but only a simple reclassification in the GIS. If roads are being converted, the local GIS units shall report this to the central GIS by indicating the road on respective map sheets.

806. Location of Bridges / CD structures

Bridges and cross drainage structures (CD) have to be added in the geographical database in case of new constructions. The procedure in updating bridges is also based on GPS technology. The local GIS unit in divisions needs to coordinate the GPS field surveys and forward the GPS coordinates to the Central GIS Unit for database update. The time for the submission of coordinates for the bridge and CD update shall be similar to road network updates so that all annual updates are done at once.

Table 900.2 Sequence and responsibilities of maintenance activities

Steps	Activity			Responsible
	Road alignment	Road classification	Location of bridges and CD structures	
1.	Prepare print-out of Section / Sub-Division with new road and mark manually approximate alignment	Prepare print-out of Section / Sub-Division and mark manually alignment of converted road	Prepare print-out of Section / Sub-Division and mark location of bridge / CD structure	Local GIS Unit
2.	Carry-out GPS field survey to capture geographical coordinates of road	In case that road is not captured in database, carry out GPS field survey	Carry-out GPS field survey to capture geographical coordinates of bridge / CD structure	To be coordinated by local GIS Unit
3.	Forward GPS coordinates to Central GIS Unit	Forward map with marked converted road or GPS coordinates to Central GIS Unit	Forward GPS coordinates to Central GIS Unit	Local GIS Unit
4.	Integrate coordinates of new road into geographical database	Re-classify road or integrate coordinates of converted road into geographical database	Integrate coordinates of new bridge / CD structure into geographical database	Central GIS Unit
5.	Segmentation of new road and assignment of unique ID to segments	Segmentation of converted road and assignment of unique ID to segments	Assignment of unique ID to new bridge / CD structure	Central GIS Unit
6.	Forward of print-out for final approval by Section, Sub-Division, Division	Forward of print-out for final approval by Section, Sub-Division, Division	Forward of print-out for final approval by Section, Sub-Division, Division	Central & local GIS Unit

807. Maintenance and updating of registers

The GIS local units shall maintain registers for roads, bridges and junction in formats given in table 900.3 and regularly update it with regards to spatial data.

808. Analytical Operations

The Central GIS Unit and the Local GIS Units shall perform analysis.

The Divisions shall prepare annual maintenance plans, based on various analyses and forward it to the Chief Engineer through circle offices. Maps shall be integrated in reports as attachments. The analytical operations on Circle level will have the purpose to scrutinize the plan documents from the Divisions. Analytical operations by the Central GIS Unit are supporting overall management decisions, mainly in terms of budget allocations (for road maintenance). The operations will be carried out on behalf and for the Chief Engineer. The Divisions shall prepare a set of thematic maps, to be forwarded for the Sub-Divisions. The Sections through the Sub-Divisions shall verify information derived from the database.

Table 900.3 gives an overview about the operational standard tasks of the different levels.

	Performing and Presenting Analysis Results	Presentation of Spatial References *
Central Office	Perform analysis and document on A3 sized maps and in report format to Chief Engineer	Provide large sized division and circle maps to every Division and Circle Office
Circle Office	Perform analysis for scrutinizing documents from Divisions and forward to CE as A3 maps and in report format	

Division	Prepare thematic maps for verification by Sub-Divisions / Sections Perform analysis for maintenance planning and forward to Chief Engineer in reports and as A3 sized maps	Prepare reference maps for Sub-Divisions and Sections on A3 sheets
Sub-Division	Data gathering Verification of analysis	
Section	Data gathering Verification of analysis	

***(Topographic Maps with emphasize on road and bridges)**

809. Regulations for Exchange of Spatial Data and Dissemination of Spatial Information

The information derived from the GIS shall be disseminated as hardcopies in the form of map sheets and reports. The different information from the GIS to be distributed among PWD could be categorized into spatial references and analysis results.

809.1. Spatial References:

Spatial references are topographic maps, showing roads, bridges, CD structures, villages, water bodies and administrative boundaries. Every office shall have a map as general reference of their respective area. The Central GIS Unit shall provide large size maps (A0 format) of every Circle and Division to the respective offices. The Divisions shall supply respective maps of Sub-Divisions and Sections on A3 size. The Central GIS Unit and the Local GIS Units upon special request could prepare other maps. These maps shall be displayed in respective offices.

809.2. Analysis results:

Analytical operations by the Central GIS Unit will be carried out on behalf and for the Chief Engineer. Outputs shall be as A3 as well as A4. For presentation purposes, maps could be printed on large sized paper. The results of analytical operations on Circle level shall be in form of A3 sized maps. The Divisions based on various analyses will generate maps on A4 paper. These maps shall be integrated in various reports as attachments.

810. Monitoring of GIS Operations

The introduction of GIS technology implies the adoption of a completely new instrument for the organization and its integration into daily working procedures thorough organizational changes, work habits and patterns. Progress and benefits shall be monitored and corrective measures undertaken. Suitable indicators for assessing the overall success and status of the GIS implementation are given in Table 900.4

In addition to the regular maintenance activities, it shall be the task of the Central and Local GIS Units to keep track and record consistently the following data:

Table 900.4 Monitoring Plan for overall impact of GIS.

Records for Impact Monitoring	To be recorded by Division Unit	To be recorded by Circle Unit	To be recorded by Central Unit
Events of data update and results of quality control			✓
Request for maps, their contents (title) and the inquirer	✓	✓	✓
Instances when maps were presented in meetings, conferences etc. on central level to support important instances (such as budget allocation), contents of the presented maps and weather there was positive, negative or non influence ¹¹			✓
Events of training, training type and contents, list of participants, trainer kind of position	✓	✓	✓
Number of positions in GIS units which had to be refilled, kind of position	✓	✓	✓

The various attributed data that form the GIS system shall be documented regularly and when changes occur. This shall be the responsibility of central GIS Cell.

811. Training, Support and Internal Communication

There are several activities which shall be executed at regular intervals in order to keep a certain level of know-how and to maintain the communication between the different GIS Units:

- All GIS Units shall meet at least once in a year with the purpose of exchanging ideas, reporting about experiences and problems, maintaining standards and procedures and getting feedback from the Chief Engineers. The meeting shall be set, organized and facilitated by the Central GIS Unit.

- Annually, the Central GIS Unit shall give a presentation on the complete database for all Divisions and Circles provide a one day refresher-course about GIS technology and introduce about latest development in general as well as within PWD in so far it is relevant to GIS operations.
- All GIS Officers shall attend an external professional training on GIS issues for about one week, once in two years. This training shall be tailored for the needs and shall include need-related aspects such as refreshing the general know-how on geographical information technology, latest trends and specific aspects, for instance advanced spatial analysis procedures, marketing strategies, data security aspects etc. Universities, other government organisations, private institutes or consultants could provide the external training.

Besides these regular activities, there are occasional activities which may come up or which supports the overall performance of GIS operations:

- In case of personnel transfer and open positions in GIS Units, the Central GIS Unit shall provide and introduction course for the replacement to assure smooth performances in the different offices
- From time to time, one or two representatives of the Central GIS Unit shall visit selected Local GIS Units for individual support. Such visits could be scheduled so that all offices have been visited once within two years.
- In order to expose the PWD staff to other systems and best practices and for the exchange of experiences, it would be recommended to organize visits to other organizations such as other government institutions where GIS is implemented (inside or outside the State) or to special organizations in the field of geographical information technology like the National Remote Sensing Center.

812. GIS in Use

812.1. Proximity Analysis:

The road network is the basis for the overall development of any region. Hence, it is a crucial parameter, well monitored for any planning studies. The proximity or nearness of any settlement or habitation to any existing road network can be measured using the GIS tools and automation can be developed for this kind of query up to a certain extent. This information is very useful in exploring the marketing network and other business activities.

812.2. Demographic Analysis:

The information on census is very important and crucial in planning and monitoring the schemes and plans for any service oriented organization. A direct relationship between road network and village level once established, census data of the revenue village level can be attached as attributes to the GIS database. This database would be very helpful in understanding the rural - urban phenomenon and enables analysis like service area selection etc. This information would be useful for developing the core networks, which is being followed in the government schemes.

812.3. Shortest Route Identifier:

This tool is a typical travel tool to identify the optimal route from one specific point to another one, based on criteria such as travel distance, riding quality of road, traffic volume etc.

For PWD, the tool could be helpful to identify most frequented roads for planning purposes. Table 900.2 relates to the identified needs for PWD to the above-described tools and their technical functions.

Reference docs

Field Data Collection using GPS-Guidelines

Data Interchange format/ protocol

Installation of RIMS – procedure/ manual

Interlinks: Attribute data / table values from: RMMS, FMS, GeoKAMS, WINGS

901. Road Maintenance Management System (RMMS)

901.1 General

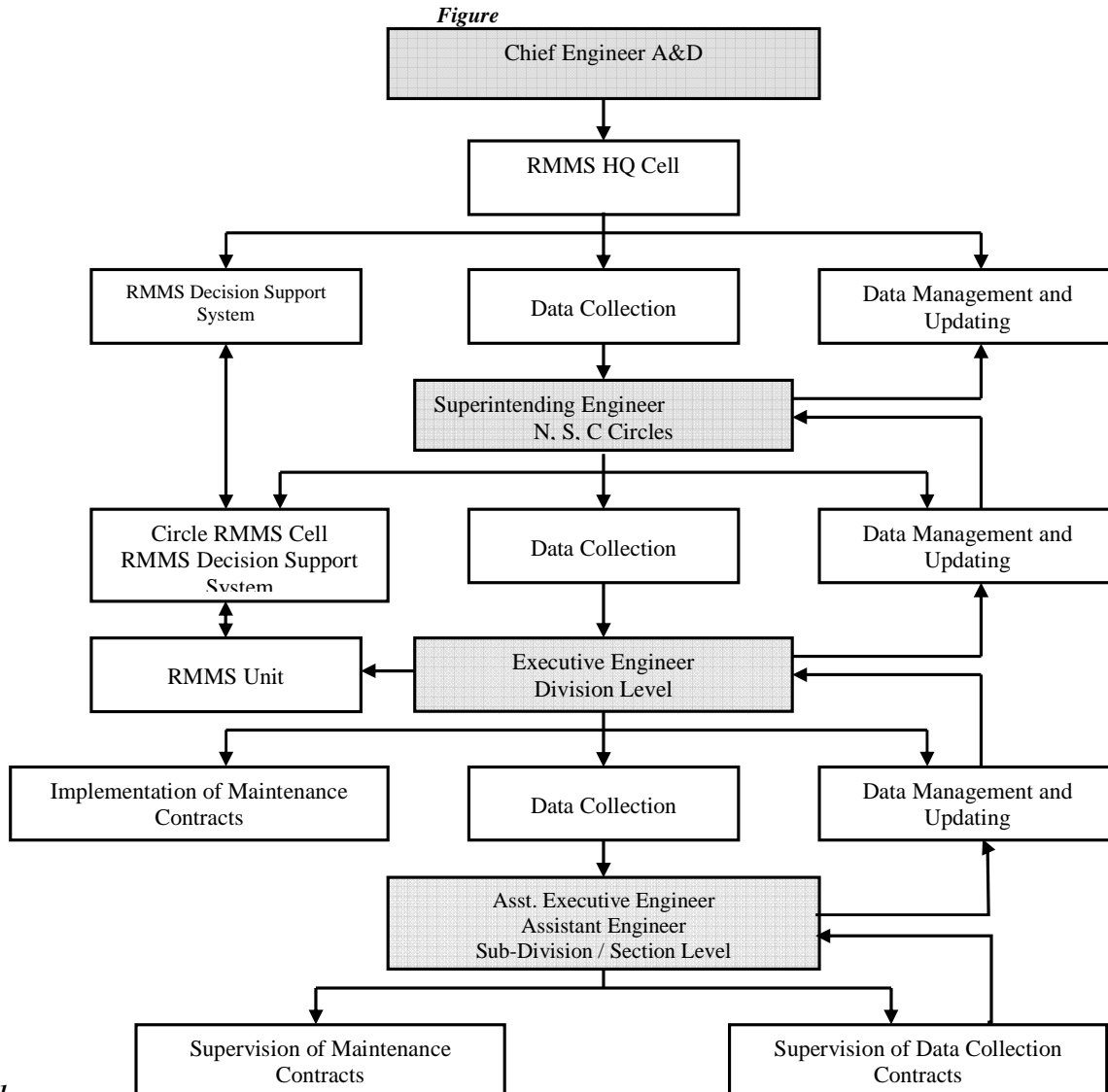
The main objectives of establishing the computerized Road Maintenance Management System (RMMS) are to optimize the use of limited resources available for maintenance works; to have a systematic approach and planning of road maintenance work program and to reduce the entire transport costs through proper and timely maintenance works. Maintenance management is a method of controlling resources to accomplish a predetermined level of service through planning, budgeting, scheduling, reporting and evaluating. Planning consists of defining maintenance activities, compiling a road inventory and condition survey details, establishing priorities, establishing quality, quantity, performance standards and compiling cost data.

902. RMMS in PWD

The road maintenance system of PWD shall have the database of all Roads and Bridges under the control of R & B wing of PWD. The RMMS includes road data such as footpath, drains, kerbs, medians etc., road inventory, and pavement condition, traffic and works history. It also includes a module, which will identify homogeneous road sections and create a file of details for use with HDM-4, which will be used as the principal tool for strategic, programme, and project analysis of maintenance.

PWD has a central RMMS cell supported by Local RMMS units at the Divisions.

Institutional arrangements for implementing the RMMS.



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902.1. Functions of RMMS

The various functions that are supported by RMMS are:

- a) The development of an annual road maintenance program that meets the needs of the road user;
- b) Develop strategies to enable the level of service required by the road user to be achieved;
- c) Support the preparation of an adequate annual road maintenance budget
- d) Annual upkeep of the Standard Schedules of Unit Rates and data;
- e) Ensure adequate spread of funding allocation to ensure preservation of roads, bridges and related infrastructure and safety of the road user;
- f) Identify emergency works required to existing roads, bridges and related infrastructure items to make them safe and keep the road traffic worthy;
- g) Making recommendations for minor road improvements and upgrading that may preserve the assets, reduce maintenance costs, improve traffic flow, improve road safety, reduce flooding, etc.;
- h) Preparation of monthly maintenance reports;
- i) Preparation of reports regarding needs of the network and effectiveness and adequacy of the maintenance budget.

902.2. Central RMMS Cell

The RMMS cell in the Chief Engineer Administration & Designs office is under the control of the Executive Engineer IT and assisted by Assistant Executive Engineer, Assistant Engineer and supporting staff.

This cell will be responsible for running and maintaining the RMMS program in all aspects. Only this cell can enter data onto the RIS database. All the other RMMS Cells/Units will only be able to enter data onto a secondary file which, once the data has been verified at all intervening levels, will be the responsibility of the RMMS in PWD Head Quarters to update the original database. This shall ensure the integrity of the database and prevent any manipulation of the stored data that might adversely affect or influence the decision making process.

The following are functions of Central RMMS cell

1. Preparation of the Annual Routine Maintenance Program for the entire PWD road network;
2. Assist the preparation of annual road maintenance budget and program
3. Co-ordinate with the Division Offices, to set procedures and timings to ensure that the annual road maintenance program is prepared to meet the required budget schedule;
4. Compile all information prepared by each District and check for adequacy of the annual or multi-year road maintenance program
5. Review of the proposals from field offices for allotment of maintenance funds under different sub-heads in consideration of the defined program and budgetary constraints.
6. Set up an effective MIS for both HQ and district offices to allow the recording and tracing of all data collection, contract procurement information, contract progress and payments, contractor performance and overall adequacy of maintenance;
7. Ensure that each district maintain the MIS and forward all information to HQ on a monthly basis to suit PWD reporting procedures;
8. Review of data to verify uniformity and adequacy of budgets and consistency of contractor performance throughout the State; undertake regular audits.
9. Collect information from field offices regarding major disasters e.g flood damage, bridge/road collapses etc. in order to provide reports on the cost of damages for information and necessary action to PWD and Government.
10. Issue directions approved by Chief Engineer Administration & Designs regarding changes to maintenance procedures and techniques for more effective and cost effective maintenance;
11. Train all staff in the latest maintenance techniques and the proper understanding of road maintenance;
12. Direct the field officers on the implementation of routine maintenance works in accordance with the PWD Road Maintenance Manual, standard documents etc.

902.2.1. Local unit

At Circle level the RMMS Cells will have full use of the software, which can be used in the development of the maintenance strategy. These units will also be able to compare the effects of allocating some of the budget to various items such as construction / rehabilitation of new roads.

At the Division level the RMMS Units will be able to view RIS database of the part of road network for which they are responsible.

There shall be an Assistant Executive Engineer supported by Draughtsman in the general divisions under the control of the Executive Engineer with the following functions

1. The administration and upkeep of RMMS throughout the State to ensure that PWD receives a suitable and adequate road maintenance budget to meet the required level of service set by the road user.
2. Ensure the conduct of road condition survey on time to meet the required budget submission;
3. Together with the AEE(GIS) check data received from the district offices for accuracy and consistency and note in particular any changes or queries;
4. Report to the RMMS Central Unit any problems with the annual maintenance programme.
5. Recommend changes to maintenance procedures and techniques for more effective and cost effective maintenance;
6. Assist in the preparation of the Annual Routine Maintenance Programme for the entire PWD road network and proposed distribution of funds for routine maintenance activities.
7. Collect information from the field offices regarding major disasters e.g. flood damage, bridge collapses etc. in order to provide reports on the cost of damages for information and necessary action to RMMS Central unit

902.3 Data Collection and Validation

The Divisions will be responsible for ensuring that the data is collected in accordance with the instructions.

Each Division will need to have a record of their road network with full network details including traffic counts. One of their tasks will be to enter the data collected in their Divisions onto specially prepared files, which will be transmitted, to the appropriate RMMS Cell in the Circle for verification by them before onward transmission to the RMMS Central Cell for updating the database.

The following details shall be regularly updated:

903. Road Network Details

903.1 Road Inventory

The Divisions will be responsible for ensuring that inventory details of all roads added to the network are collected and transmitted to the Circle RMMS Cell for verification and onward transmission to the RMMS Central Cell for entry onto the RIS database. Any changes in inventory must also be sent to the Circle RMMS Cell for verification and onward transmission to the RMMS Central Cell, and this includes details of recently completed road maintenance works.

903.2. Road Condition Details

The RMMS Central Cell will be responsible for instigating all road condition surveys. They will contact the RMMS Cells in the three Circles who will be responsible for collection and validation.

There is a need for those engaged in road condition surveys to meet together on an annual basis to ensure that a uniform standard system is adopted for recording the condition of the roads throughout the State. The timing of the surveys will be subject to the approval of the Chief Engineer Administration & Designs but will normally take place on an annual basis after the monsoon season.

903.3. Structures – Inventory and Condition Details of Culverts and Bridges

The Divisions will be responsible for reporting changes in the inventory to the RMMS Cell in the Circle for verification and onward transmission to the RMMS Central Cell for entry onto the database.

Collection of the condition details will follow a similar pattern to that for road condition surveys.

904. Performance Monitoring

It will be the responsibility of the Divisions to send details of all road maintenance activity to the RMMS in the Circle for verification and onward transmission to the RMMS Central Cell.

905. Traffic Information System

Instructions regarding the collection of traffic data will be issued by the RMMS Central Cell to the RMMS Cells in the Circles in a similar way to that for the road condition surveys.

Concerned Divisional Engineer in contact with the weighbridge operators shall forward axle load details to the RMMS Central Cell on a regular basis. Independent surveys to obtain specific axle loadings to corroborate the information provided by the weighbridges shall be conducted.

The traffic data, coupled with economic forecasts will be used to determine vehicle growth rates that are a basic requirement of HDM-4. The RMMS Central Cell will have the ultimate responsibility for ensuring that vehicle growth rates are determined.

905.1. Vehicle Operating Costs

These will need to be updated on an annual basis to ensure that they reflect the actual situation. This task will be the responsibility of the RMMS Central Cell.

906. Maintenance Intervention Costs

These costs will be generated and updated based on either recent or current maintenance intervention contracts. The Divisions will be responsible for submitting this data to the RMMS/HQ Circle via the RMMS Cells in the Circles. The RMMS Central Cell will be responsible to analysing the contracts to determine the required maintenance intervention costs. Different maintenance interventions may be used and these must be added to this group of data along with the relevant costs.

907. Reporting

At the start of each financial year a new State version of the RMMS Database will be released for all users. This will contain all the recently collected condition data and Ordnance and Inventory revisions. Central unit users will be able to obtain new versions via the network but in the short term CDs will have to be issued to the divisions.

Details of the completed maintenance work to be sent to the RMMS Cell in the Circle for verification and onward transmission to the RMMS Central Cell for updating the records.

Maintenance intervention costs on a sq. metre basis shall be returned to the RMMS Cell in the Circle for verification and onward transmission to the RMMS Central Cell where they will be used to determine future maintenance costs.

908. Specific use

908.1. Prioritization and budget proposal

This is the stage at which the RMMS/HDM-4 program is used to develop the strategy to be adopted by the PWD with regard to road maintenance during the next financial year. It gives required data for the necessity of each item of work to be incorporated in the preparation of the maintenance estimate.

For each maintenance intervention selected the program will produce a prioritized list of roads. Priority being given to that road which is in greatest need of maintenance based on such factors as current condition and future estimated traffic volumes. Different maintenance interventions will result in a different prioritized list of roads.

The task of the Chief Engineer and the Superintending Engineers from Circles is to determine the optimum intervention strategy for each road and the required budget for same.

908.2. Scenario generation

The maintenance interventions adopted for each road may be different and hence there is no need to treat all the roads in the same manner. However there is a need to determine the optimum intervention and the length of road to be so treated. There will be an economic length of road below, which the costs per kilometre will raise. For example the costs/ kilometre to carry out the same maintenance intervention are likely to be more for a 0.5 km length than for say a 3.0 km length.

908.3. Constrained budget allocation

In accordance with State requirements the PWD will submit their budgets for road maintenance. The State will review the budget request and in turn produce an approved list of roads for maintenance, which will form the PWD budget for the following year. The same process covers both Plan and Non-Plan works.

909. Input into project planning and design

In the case of major up-gradations and strengthening projects, the detailed planning and design stages shall require assistance from the RMMS database.

1001. SAFETY

1002. General. This chapter details the safety measures to be followed in various construction and maintenance operations. The aim is to provide and maintain a working environment that is safe and effectively minimises risks to the health of its employees, contractor, equipments and members of the general public.

PWD shall ensure safety by

- placing the health and safety of all people ahead of the provisions of service.
- adequately training staff in the safe performance of jobs and in the basic areas of accident prevention.
- following all specific rules of the Department consistent with PWD's health and safety objectives.
- Taking corrective action for every incident with the potential to cause harm, whether such harm eventuates or not, and also in the case of every accident.
- Insisting on arrangements for the safe use, handling, storage and transport of equipment and substances.
- Insisting on adequate facilities and protective clothing & equipment to protect the health and safety of all employees

The practice of safety involves shared responsibilities and a team approach by all employees. Everyone associated with PWD shall be responsible for their own health and safety, and the safety of others affected by the actions of their work. Necessary provisions for safety shall be foreseen and incorporated in the estimates during project preparation stage itself.

1003. Safety Equipment

PWD shall insist on provision of protective clothing and equipment where hazards cannot otherwise be prevented or suitably controlled, and when complete protection is essential. First Aid facilities shall be made available at all offices and worksites, for the treatment of employees (including contractors) and visitors who are injured or become ill.

1004. Accidents

Working in the construction industry can sometimes be dangerous. Work-related accidents can cause serious injuries, while most of these accidents are preventable. Accidents are mainly classified into 4 types, viz. fatal accident, grievous injury accidents, minor injury accidents and non-injury accidents as per IRC 53 Road Accident Forms A-1 and 4. The following procedure shall be adopted in case of accidents.

1004.1. Major Accident:

An accident will be considered a major one, if it involves loss of life (fatality), serious injury to any person (grievous injury), non-injury accidents involving loss of property likely to cost Rs. 50 lakh or more or would cause serious disruption of normal life in the area affected, such as by interruption to main lines of communication etc. In case a major accident involving structures under construction or under maintenance by P. W. D. occurs, the following procedure shall be followed.

- ii. The Overseer or Subordinate under the control shall inform the Assistant Engineer, Assistant Executive Engineer and Executive Engineer of the accidents by the quickest possible means. The Police Inspector having jurisdiction over the area shall also be informed in cases of death or serious injury to person and where criminal activity is suspected.
- iii. The Assistant Engineer and Assistant Executive Engineer concerned shall, on receipt of such information proceed to the spot within the shortest time possible and organise or assist in rescue operations. The Assistant Executive Engineer or in his absence the Assistant Engineer shall immediately inform through suitable means (telegram/ fax/ email) for official recording the Executive Engineer, the Collector of the District, the Superintending Engineer and Chief Engineer briefly giving details of the accident. Where the accident involves electrocution, the Electrical Inspector shall also be informed.
- iv. The Executive Engineer on receipt of such information shall send an email or fax message to the, **Chief Engineer Administration & Designs and who shall report to** Secretary to Government, Public Works Department giving brief details of the accident. He shall also proceed to the spot within 24 hour, of the accident or in as short a time as possible and hold a preliminary enquiry on the cause of the accident etc. and submit a detailed report to the Superintending Engineer and the Chief Engineer within 3 days of the completion of the enquiry. This enquiry shall be independent of any Police enquiry in the matter.

- v. The Superintending Engineer shall, on receipt of information, inspect the site within 3 days or as short a time as possible and ascertain by personal enquiry the causes of the accident, the adequacy of relief measures, and also find out best means of restoring normal activities in the affected area. His report shall be sent to Chief Engineer independently of the Executive Engineer's report within 3 days after his inspection.
- vi. The Chief Engineer shall inspect the site within a week of the occurrence of fatal accidents or as early as possible and make such personal enquiries as he feels necessary in order to furnish a full report of the accident to **the Chief Engineer Administration & Designs and he in turn submit report to Government**, detailing the causes, the action taken thereafter and action to be taken to restore normalcy in the area. In addition, this report shall contain information as to whether there is prima facie negligence or dereliction of duty on the part of any Government servant and if so, make recommendations regarding disciplinary proceedings to be taken against the delinquents.

1004.2. Minor Accidents

Minor injury accidents and non-injury accidents involving loss of property likely to cost less than Rs. 50 lakh shall be Minor accidents. First aid shall be provided immediately to affect persons and medical aid sought in case of minor injury accidents. All accidents shall be reported to superior officers. In case of damage to property the value shall be assessed and reported.

1005. Job Hazard Analyses

A job hazard analysis is a technique that focuses on job tasks as a way to identify hazards before they occur. It focuses on the relationship between the worker, the task, the tools, and the work environment. After an uncontrolled hazard is identified, steps shall be taken to eliminate or reduce them to an acceptable risk level.

Many workers are injured and killed at the workplace which can be prevented by looking at workplace operations, establishing proper job procedures, and ensuring that all employees are trained properly. The best way to determine and establish proper work procedures is to conduct a job hazard analysis.

Job Hazard Analyses (JHAs) shall be a part of major projects that entail:

- jobs with a high frequency of accidents or near misses which pose a significant threat to health and safety;
- jobs that have already produced fatalities, disabling injuries, illnesses or environmental harm;
- jobs that have the potential to cause serious injury, harm, or damage, even if they have never produced an injury or illness;
- jobs involving two or more workers who must perform specific tasks simultaneously;
- newly established jobs whose hazards may not be evident because of lack of experience;
- jobs that have undergone a change in procedure, equipment or materials;
- jobs whose operation may have been affected by new regulations or standards; and
- Infrequently-performed jobs where workers may be at greater risk when undertaking non-routine jobs.

1005.1. Safe Job Procedures shall ensure a safer or healthier way of performing the job.

Basic stages in developing Safe Job Procedures are:

- Identifying/selecting the job to be analyzed
- Breaking the job down into a sequence of basic steps
- Identifying potential hazards in each step
- Determining preventive measures to overcome these hazards

This shall include:

- Regulatory requirements
- Personal Protective Equipment like
 - ▲ Safety glasses (e.g. for use during welding, blasting or other activities that could result in eye damage).
 - ▲ Ear protection (e.g. ear plugs or ear muffs).
 - ▲ Safety shoes/boots.
 - ▲ Gloves.
 - ▲ Hats shall be provided to reduce impacts of sun and heat.
 - ▲ Shirts shall be worn at all times.
 - ▲ Reflective equipment, materials and clothing shall be provided for road workers, particularly if work is continuing at night.
 - ▲ Safety signs and safety induction measures.

- ▲ First Aid Kit available on site, first aid person trained on site or knowledge of access to doctor/hospital.
- Training requirements
- Responsibilities of each person involved in the job and publishing the names of the persons and organizations to be contacted in the event of an emergency
- A specific sequence of steps to follow to complete the work safely
- Permits required
- Awareness of emergency procedures,
- Publishing the location of the emergency responsive equipment and ensuring the equipment is well located, visible and properly maintained.

A well-documented **safe job procedure** shall form the basis for initial job training and as a briefing guide for infrequently performed jobs. It may be used as a standard for safety inspections or observations and it will assist in completing comprehensive accident investigations. Whenever an incident occurs, the Safe Job Procedure shall be thoroughly reviewed by the worker and supervisor to ensure that no important step is missing and that the Job Procedures meet current regulations.

1006. Road Safety

An accident is a rare multi-factor event always preceded by a situation in which one or more road users having failed to cope with their environment, resulting in vehicle collision, vehicle to rider or vehicle to property collision. It could be due to road users have failed to cope with their environment. Therefore Engineers can make the road user to cope with, by improving road and travel environments. However, prevention and reduction in accident rate can be achieved only with education and enforcement programmes along with engineering measures.

1006.1. Central Road Safety Cell (CRSC)

Under the **Chief Engineer Administration & Designs** a Central Road Safety Cell has been established. The Cell is primarily to coordinate the road safety activities of the PWD including undertaking of road safety audits at various stages; identification of black spots, the improvement of the accident sites in a phased manner, establishing Road Safety Cells at a district level and interdepartmental co-operation, coordination and collaboration with all stakeholders of road safety and with the Kerala State Road Safety Authority.

The following road safety activities shall be the prime responsibility of the central road safety cell of PWD,

- Prioritised Blackspot Improvement Program
- Road Safety Audit of existing roads
- Mass Action schemes
- Engineering measures for vulnerable road users
- Audit of upcoming project roads
- Training and Establishing Road Safety Cells at district level
- Interdepartmental coordination, cooperation and collaboration.
- Accident report compilation with GeoKAMS output, analysis, and preparation of annual accident report
- Implementation and Review of Road Safety Action Plan
- Development of Road Safety Strategy and Program

1006.2. Road Safety in Divisions

The road safety activity of PWD divisions shall be carried out by the Executive Engineer assisted by his subordinates under the guidance of Central Road Safety Cell. They shall also support the District Road safety wing under the control of District collector.

The Divisional offices of road safety shall report all road accidents in their jurisdiction to Central Road Safety Cell propose safety engineering measures for such locations; identify accident blackspots; design and prioritise the schemes; and implement/improve such schemes under overall supervision of Central Road Safety Cell. Also to coordinate the road safety activities of the PWD at district level, prevention and eviction of encroachments on roads, action to make the roads safe by timely maintenance and interdepartmental coordination with all stakeholders of road safety. The Executive Engineer shall review and monitor the progress of road safety works of concerned divisions and report will be submitted to the CRSC on a monthly basis.

1006.3. Road safety engineering

A systematic, data-led process for devising and implementing road design and traffic management that effectively prevent and reduce road accidents.

1006.4. Road safety audit of new schemes (Accident Prevention)

Road safety audit is a systematic method of checking the safety aspects of new road schemes before they are built. The process of road safety audit shall include commissioning audit, initiating audit and provision of brief, undertaking audit, design and BOQs, responding to audit, and finalising actions. Various aspects to consider when undertaking audits and the checklist are the following:

1. Planning
2. Cross section
3. Alignment
4. Roadside communities
5. Junctions: general.
6. Junctions: Additional check for roundabout.
7. Junctions: Additional check for signal controlled junctions
8. Special road users
9. Signs, Markings and lightings, and
10. Roadside hazard

Road safety audit shall be conducted as per the road safety audit manual published by the Kerala PWD and available at the website: www.keralapwd.gov.in/intranet/eknowledge/document/auditmanual.pdf

1006.5. Road safety assessment of existing roads (Accident Reduction)

The audit procedure shall be used on existing roads. Regular audit of existing roads enables hazard to be identified before an accident occur and to remedy those situations that are causing accidents. This involves the regular assessment of accident data and driving speeds on project roads and regular reassessment of road functions. Following measure shall be strictly followed.

- Advertisement hoarding shall not be allowed at or within 100m of any road junction, bridge or another crossing, within 10m of the edge of carriageway.(as prescribed in the IRC-46-1972)
- Road boundary shall be demarcated and all encroachments shall be evicted.
- Stacking of materials in the Clear Zone (5m from the edge of pavement on rural roads and 3m on urban roads) roadway shall not be permitted
- Speed breakers for control of vehicular speeds on minor roads shall be done as per IRC 99

1006.6. Black spot Improvement Programmes

A junction, a bend or short length (300-500m) at which accident are clustered, shall be called as a Blackspot and following standard process shall be carried out to improve all such spots.

- 1) Identify accident site
- 2) Preliminary accident analysis
- 3) Site visit
- 4) Final Diagnosis
- 5) Develop countermeasures
- 6) Detailed design
- 7) BOQ
- 8) Economic Evaluation
- 9) Prioritisation and program
- 10) Implementation
- 11) Monitoring and Evaluation

Black spot improvement programme shall be implemented in a phased manner and the details of all above mentioned process shall be carried out as per the accident site manual published by the Kerala PWD and available at the website:

www.keralapwd.gov.in/intranet/eknowledge/document/accidentsitemanual.pdf

1007. Signs and Markings Programmes

1007.1. Signs

Signs shall be installed based on IRC-67-2001 and shall be carried out as per the supplementary technical advice for IRC-67 published by the Kerala PWD and available at the website:

www.keralapwd.gov.in/intranet/eknowledge/

In installation of signs priority shall be given to gateway sign, junction signings, bend signs, school signs, regulatory and prohibit signs and hazard markers and hump warning and informatory signs.

1007.2. Markings

Markings shall be applied based on IRC-35-1997. In markings on a road, priority shall be given to centre line, edge line (where adequate width is available), junction marking with appropriate traffic control for junction, pedestrian crossing markings, hump and rumble strip marking and hazard markings.

1008. Specification for road safety items.

The specification on road safety works shall be carried out as per specification section 800 of MoRTH specifications for road and bridge works and items not included shall be carried out as per Road Safety Cell's specifications for traffic signs and other safety-related works published by the Kerala PWD and available at the website:

www.keralapwd.gov.in/intranet/eknowledge/document/road_safety_spec.pdf.

Where no technical specifications have been mentioned in the IRC Codes and Standards, only approved and agreed CRSC guidelines (as developed based on International Standards and proven research) are to be followed such as Chevron sign, Retro-reflective Sheeting, RRPM Signs, Solar RRPM, Marking materials, Crash barriers, and raised humps.

1009. Safety Measures at Road Construction works.

All road works, no matter how small, must be properly signed. It shall warn, inform and direct all road users at all time about the approaching hazards.

Details of guidelines like components of construction zone, traffic control devices and traffic management practices shall be as per IRC-SP-55-2001.

1009.1. Mandatory Provision

A separate estimate provision shall be included for road safety works in all estimates of contracts. In major projects exclusive road safety provision shall be included and for minor works, 5% contract value shall be set apart for road safety items.

1010. Safety of Buildings / Structures

The Assistant Engineer under the control of buildings/ structures shall inspect all buildings/ structures twice a year and record certificates to the effect that the building/ structure is not unsafe for use.

All buildings/ structures are required to be inspected once a year by the Assistant Executive Engineer under the control to ensure that the building/ structure are safe for use.

In case of electrical and other installations the Assistant Engineer (Electrical) under the control of buildings/ structures shall inspect the same twice a year and record certificates to the effect that electrical and other installations are safe for use. The Assistant Executive Engineer (Electrical) shall also inspect the same once a year to that effect.

In the event of any such deficiencies found in the building/structure necessary report shall be made to higher authorities and immediate steps taken to get the same inspected by the Executive Engineer and further action taken to rectify the defects.

The Executive Engineer shall also inspect important buildings/structures once a year. He shall bring to the notice of his Superintending Engineer, cases where he has reasons to doubt the structural soundness of any building/ structure and the latter will take prompt action, as he considers necessary.

When any deficiency is found in the important buildings like Raj Bhavan, Ministers Bungalows, Legislative complex, High Court buildings and houses of other V.I.Ps, report about unsafe conditions shall be sent to the Chief Engineer, with his recommendations and proposal for repairs or disposal of the building. As a follow up action, if it is decided to demolish any such unsafe buildings it shall be disposed of without land by auction under the powers vested in competent authority.

1011. Safety of Bridges

The safety and integrity of bridges shall be ensured through proper design guidelines and regular inspection and review. The responsibility for bridge safety shall be vested with the Executive Engineer,

Bridges Division supported by Assistant Executive Engineer, Assistant Engineer and subordinate staff. He shall provide technical review, comments and recommendations on design and construction services, widths, load capacities and operational requirements for bridge repairs, replacements and upgradation. He shall maintain a bridge inventory database of all bridges within his jurisdiction, set priorities for maintenance, repair, and replacement needs and prepare budget proposals. Maintenance of bridge shall include railings and signs as well. He shall also implement and administer the bridge safety and inspection programs through the development of policies and guidelines. Bridge inspection reports shall be prepared as per procedures detailed in the Chapter on Bridge Maintenance.

1012. Disaster management

Human life may get affected due to disasters like landslide, flood, tsunami, earthquake, cyclone, tornado, building collapse, external aggression, terrorist insurgencies etc.

The District Collector shall be under the control of emergency measures. PWD Executive Engineers, in liaison with the District Collector, shall be in the forefront of salvage measures and shall get into action on a war footing basis.

Executive Engineer Buildings, shall arrange for necessary refugee camps, with water supply and sanitary facilities. The Executive Engineer Roads/ NH shall restore transport facilities by clearing blockages and rectify damages to roads. The Executive Engineer shall inspect safety of bridges and where these are found to be unsafe, shall arrange for temporary bridges/ crossings.

In the eventuality of such disasters, top priority shall be given to rehabilitation/ reconstruction activities. All necessary materials, labour etc. shall be arranged through local contractors and equipments/ vehicles hired. This shall be well coordinated with other agencies through the District Collector.

Funds for each department shall be based on the assessment by revenue authorities, which shall be subsequently allotted.

1013. Safe Environment Practices

Sustainable development shall be ensured through safe environmental practices. All construction activities cause disturbance to the environment in one-way or the other. Care shall be taken to minimise such effects as per the provisions of various acts and rules detailed in sections 1200 and 1300

The PWD offices shall be maintained spotlessly clean and in safe environment. The premises shall be provided with gardens and trees. Waste disposal shall be done regularly without affecting environment. Burning of wastes shall be done through incinerators as far as possible, if not in an open area enclosed by fence and under adequate fire safety measures.

SECTION 1100

1101. Environmental Management

1102. Introduction

This chapter describes the various environmental issues associated with the activities of PWD and provides details of the environmental management measures that shall be followed. There shall be an Environmental and Social Management Unit (E&SMU) in the office of Chief Engineer Administration & Designs and at the General Divisions level

The objective of environmental management is to enhance the positive environmental impacts and abate/mitigate negative environmental impacts of construction activities and related works. Good environmental management also ensures compliance with all applicable National, State and Local Environmental legislations.

This chapter provides the following information:

Description of environmental issues relevant to PWD activities

List of applicable legislations at the national, state and local level

Institutional settings pertaining to legislation

Environmental clearance requirements

For regular works, the process to integrate environmental management measures with implementation.

For certain other works requiring further environmental studies prior to implementation, the process for conducting the Environmental Impact Assessment (EIA) and developing the Environmental Management Plan (EMP).

Environmental training & capacity-building

Environmental communication and consultation.

This chapter is supported with Appendices that provide guidance on various environmental management activities.

1103. Environmental issues in roads, bridges, buildings and others

Sustainable development with thrust on environmental protection has become the corner stone of the policies, programmes, procedures and practices governing the development of industrial and infrastructure projects in India. PWD is committed to prevent or mitigate environmental degradation and to promote the integration of the environmental concerns in the development projects. The environmental issues to be considered in all stages of the project are described here.

1103.1. Land

Projects involving land disturbance, removal of vegetation and reshaping of topography make the soil vulnerable to erosion, dust generation and generation of waste materials. The mitigation measures shall be included in the planning and design stage to ensure its effective implementation during the project execution. These include:

Compensatory planting.

Ensure surface is reinstated, smooth and free of encumbrances.

Minimize waste from construction and reuse of waste material wherever possible.

Solid waste shall be placed to minimize intrusion into the carriageway in consultation with local self government authorities.

Collect similar types of construction waste into common piles and dispose suitably.

Put general litter and waste into special purpose bins or remove to covered designated area and ensure it is contained.

1103.2 Air

Air pollution occurs when the air contains pollutants like gases, dust, fumes or odour in harmful amounts that affect the health or comfort of humans and animals or which could cause damage to plants and materials.

The sources of the air pollution in the infrastructure projects include, but not limited to;

Site clearance, transportation of men and materials, construction of temporary accommodations, stock yards, installation of construction plants during the pre- construction stage,

Operation of construction plants such as hot mix plant, concrete batching plant, crusher and wet mix macadam (WMM) plant,

Excavation of foundation, roadway and borrow areas,

Operation of machinery and vehicles,

Construction of roadway, buildings and bridges,

Stock piles of materials

With the proper assessment of the degree of pollution from each source, required mitigation measures and preventive measures can be delineated for the protection of air quality from further degradation and keep the ambient air pollution levels of the project area within limits stipulated in National Ambient Air Quality Standards. Some of the measures for the prevention and mitigation of the air pollution due to the project are:

Selection of project location or preferred alignment and design

Fitting required air pollution control equipment for the machinery, plants and vehicles

With proper periodical maintenance and servicing of the pollution control equipment and the machinery, plant and vehicles

Limited tree cutting, and planting of more trees

Watering of the access roads and approach roads or provide seal coat

Watering of the materials before loading into the plants for reduction of dust generation

Limit the extent of disturbed areas and restore the disturbed areas

1103.3. Water

Water pollution is "the loss of any of the actual or potential beneficial uses of water caused by any change in its composition due to human activity".

Source of the water pollution and impacts on the water environment include but not limited to:

Loss of water resources such as relocation of wells, hand pumps, tube wells, loss/ filling part of water bodies and change in the flow pattern of water.

Pollution of streams due to increase of sediment laden runoff,

Pollution of water sources from the oil spills, disposal of bituminous materials, stockyard of diesel, engine oil, chemicals, bitumen, emulsion etc.,

Disposal of wastewater generated from the temporary living facilities,

Wastewater generated from the operation of plants, cleaning of machinery and equipment,
Wash water from the workshop and washing bay.

With the proper characterization and quantification of waste water from each source, required treatment facilities can be designed and implemented for the control of water pollution. Some of the mitigation measures for the prevention and/ mitigation of the water pollution are:

Controlling the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes) from a construction and disallowing these substances into the waterways, storm water systems or underground water tables. Such materials shall be captured before they reach drains and waterways by following methods: (i) Cover stockpiles or spray water to suppress dust, (ii) Store all chemicals, fuels and other hazardous liquids and solids according to manufacturers specifications within a bunded and covered area or land depression away from waterways, (iii) Dispose of empty drums and as soon as possible appropriately or through a licensed contractor or to a licensed disposal centre and (iv) Water quality management e.g. using sandbags to filter water and remove sediment and control litter;

Limiting the areas of disturbed land,

Progressively clearing the site in accordance with construction needs and rehabilitate as soon as possible,

Protect drainage lines with sediment basins and silt fences,

Construction of proper sanitation facilities for the disposal of the wastewater generated from the kitchen and toilets.

Construction of proper wastewater treatment facilities for the wastewater generated from the workshops, concrete batching plants, hot mix plants and wet mix macadam (WMM) plants. Wash out ready-mix concrete agitators and concrete handling equipment at such facilities. Such treatment plants shall be considered while planning major infrastructure projects and the treated water shall be recycled and reused for gardening or irrigation.

Rainwater harvesting shall be done as per Clause 5.5.12 of Part 9 Section I of National Building Code and the collected water shall be used for gardening, flushing, firefighting or washing purposes.

1103.4 Noise and Vibration

Noise pollution is unwanted human-created sound that disrupts the environment. The dominant form of noise pollution in the infrastructure projects is from vehicles, machinery, equipment, construction plants, construction works and vehicles plying on the road.

The noise pollution from the project activities can be reduced with the proper planning and design of the noise control measures and proper work planning. Some of the noise control measures for the reduction of the noise from the project are as follows:

Use of quiet equipments, machinery, plant and vehicles available in the market

Proper maintenance of equipment, machinery, plant and vehicles

Installation of machinery with correct foundations to reduce to vibration

Enclosing the noisy equipment

Providing noise attenuation screens, wherever required

Proper planning of the working hours (noise generating activities scheduled for the middle of the day)

1103.5 Flora and fauna

Construction of road, bridges, buildings and other structures may impact flora and fauna. The degree of the impact varies based on the location, scope and size of the project. Some of the impacts that occur are:

Cutting of trees

Damage to the aquatic life

Damage to the fauna

Damage to national parks, wild life sanctuaries and reserve forests

Impacts on National Parks

Damage to Biosphere Reserves

Damage to the mangroves

With assessment of the nature and scale of impacts on flora and fauna, required preventive or mitigation measures can be addressed during the planning and design stage. The damage to the biological environment can be prevented or reduced with the implementation of preventive or mitigation measures designed during the planning and design stage. Some of the common mitigation measures are:

Saving the trees as far as possible with proper design and alignment changes and selection of location of the project

With proper work planning during execution for the reduction of disturbance to the aquatic life

Providing proper animal crossings, water crossings, fencing and traffic control measures

Planting tree saplings by (i) providing temporary protective barrier around existing trees for protection during construction works, and (ii) not placing equipment or excavate within 2 metres of a tree.

1103.6. Cultural Environment

There may be some impacts on the cultural environment due to the infrastructure project during the pre construction and construction stages. The impact varies from loss of the part of the property to the total property.

The negative impact on the cultural environment can be prevented by changing the location of the project and/mitigated by the relocating or modifying the affected structure. An important aspect here is the timely and open communication with the property owners and community by:

Speaking to the local representatives.

Placing a sign in a prominent position.

Providing a newsletter to affected people.

1104. Environmental Regulations (National, State and Local)

The various prevailing environmental acts and rules relevant to the PWD activities are listed here. This includes National Acts & Rules administered by the Ministry of Environment & Forests, other National legislation that are relevant and State Acts & Rules.

1104.1. National Level Acts

The following National Legislations are in force in Kerala

The Environmental (Protection) Act, 1986 and the Environmental Impact Assessment Notification, 2006

The Water and Air (Prevention and Control of Pollution) Act

The Public Liability Insurance Act, 1991

National Environment Tribunal Act, 1995

The National Environment Appellate Authority Act, 1997

The Forest (Conservation) Act, 1980

The Wildlife (Protection) Act, 1972

The Biological Diversity Act, 2002

Declaring Coastal Stretches as Coastal Regulation Zone (CRZ) and Regulating Activities in the CRZ.

The Motor Vehicles Act, 1988

The Ancient Monuments and Archaeological Sites and Remains Act, 1958

The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act 1996

In Appendix 1200.1, a brief description of these Acts as well as their implementing agency has been provided.

1104.2. Other National legislations to be followed

In addition to the above detailed legislations, the rules and conditions of the following Acts/ Legislations have to be followed

Explosives Act, 1884 and Explosive Rules, 1983:

Petroleum Act, 1934 and Petroleum Rules, 2002:

The Mines and Minerals (Regulations and Development) Act, 1957 and rules there under.

In Appendix 1100.1, a brief description of these Acts & Rules as well as their implementing agency has been provided.

1104.3. State level Legislation and other Acts

The additional legislations, which are to be followed in Kerala, are as follows:

Kerala Forest Act and its amendments

Kerala Forest Rules

Kerala Private Forests (Vesting and Assignment) Act

Kerala Forest (Vesting & Management of Ecologically Fragile Lands) Act & Rules.

Government Order – Kerala Forest (Vesting & Management of Ecologically Fragile Lands) Rules – Constitution of Tribunal

Kerala Preservation of Trees Act

Kerala Forest Produce Transit Rules

Kerala Restriction on Cutting and Destruction of Valuable Trees Rules.

Forest Settlement Rules

Kerala Captive Elephants (Management and Maintenance)

Kerala Coastal Zone Management Authority

In the particular context of the various PWD activities, the provisions of these legislations should be kept in mind for their relevance in the context of each works / projects that are being proposed for implementation.

1105. Organizations implementing environmental regulations

Strict enforcement of the environmental regulations, legislation, policy guidelines may impact the project, as many Government agencies are responsible for issuing of permissions and monitoring of implementation of compliances to the conditions of the permissions issued. The following agencies would play important roles in the case of projects.

1105.1. Ministry of Environment and Forests (MoEF)

MoEF is the nodal agency in the administrative structure of the Central Government, for the planning, promotion, co-ordination and overseeing the implementation of environmental and forestry programmes. The principal activities undertaken by Ministry of Environment & Forests, consist of conservation and survey of flora, fauna, forests and wildlife, prevention & control of pollution, afforestation and regeneration of degraded areas and protection of environment, in the framework of legislations.

MoEF has set up regional offices. The regional office for the State of Kerala is located at Bangalore in the neighboring state of Karnataka. This office is responsible for collection and furnishing of information relating to EIA of projects, pollution control measures, methodology and status, legal and enforcement measures and environmental protection in special conservation areas such as national parks, sanctuaries, wetlands, and mangroves.

1105.2. Central Pollution Control Board (CPCB)

CPCB is a statutory authority attached to the MoEF and located in New Delhi. The main functions include the following:

- Advise the Central Government on any matter concerning prevention and control of water and air pollution,
- Plan and execute a nation-wide programme for the prevention, control or abatement of water and air pollution;
- Co-ordinate the activities of the State Board and resolve disputes among them;
- Provide technical assistance and guidance to the State Boards;
- Plan and organise training of persons engaged in programme on the prevention, control or abatement of water and air pollution;
- Organise through mass media, a comprehensive mass awareness programme on the prevention, control or abatement of water and air pollution;
- Collect, compile and publish technical and statistical data relating to water and air pollution;
- Lay down, modify or annul emissions and air / water quality standards,
- Prepare Manuals, Codes and guidelines, and
- Disseminate information.

1105.3. Kerala State Pollution Control Board (KSPCB)

Established in 1974 (renamed to its present name in 1984), KSPCB is entrusted with the implementation of the Water Act, Water Cess Act, Air Act, Public Liability Insurance Act, Environment (Protection) Act and various rules and notifications under the same.

Working under the Department of Health & Family Welfare of the Government of Kerala, KSPCB has its head office at Thiruvananthapuram, regional offices at Ernakulam and Kozhikode, district offices at Thiruvananthapuram, Kollam, Pathanamthitta, Alappuzha, Kottayam, Thrissur, Palakkad, Malappuram and Kannur. KSPCB also has a central laboratory at Ernakulam and there are laboratories attached to all the field offices.

1105.4. State Department of Science, Technology & Environment

In relation to environmental matters, this State Department performs the functions similar to the MoEF at the state level. MoEF has delegated certain functions to the State DoE to oversee. For instance, establishing and ensuring adherence to the State Coastal Zone Management Plan (CZMP), which is in line with the CRZ Notification, 1991, is a function of the State DoE. The DoE houses the Coastal Zone Management Authority, which provides the CRZ clearance after verifying that it is in line with the CZMP.

1105.5 Kerala State Forest Department

The Kerala State Forest Department is responsible for the protection and managing the notified forests and associated wildlife within the state. The Department is headed by a Principal Chief Conservator of Forests, and is supported by Chief Conservator of Forests responsible for its various functions. For general administration there are Forest Circles headed by Conservators, under their jurisdiction forest Divisions controlled by Divisional Forest Officers. Each Division is further sub divided by basic units – Forest Ranges manned by Forest Rangers reporting to the Divisional Forest Officers.

1106. Environmental and other related clearances

Various environmental, labour and other departmental permissions may be required for the PWD activities prior to implementation. An indicative list of clearances and the responsible department / board are included in the following table.

S. No	Clearance	Department/ Board
1.	Environmental Clearance	MoEF/ State Department of Science, Technology & Environment / State Pollution Control Board
2.	Forestry Clearance	Central/ State Forest Department
3.	Consent For Establishment and Consent for Operation of Construction Plants	Kerala State Pollution Control Board
4.	Permission for withdrawal of ground water from the regulatory zones	Central Ground Water Board/ Authority
5.	Permission for taking surface water	Irrigation Department
6.	Labour licence	State Labour Department
7.	License for Setting up of Diesel Pumps	Department of Explosives
8.	Registration of Workers	Kerala State Construction Workers Welfare Board
9.	Permission for opening of new quarries for aggregates	Department of Mining and Geology
10.	PUC Certificate for Vehicles and Machinery	Road Transport Department
11.	Permission for setting up of labour camps	Local Health Departments and Local Body

Based on the works / projects being done, PWD needs to ensure that the necessary clearances are obtained prior to implementation and the clearance conditions are complied with during implementation.

1106.1 Regular works / projects – Standard EMP

In the regular works / projects of the PWD, the environmental issues need to be properly and effectively managed. In principle, PWD needs to ensure the following in all its regular works / projects:

Avoid or minimize tree cutting as far as possible; if tree cutting is unavoidable, make plans for compensatory plantation,

Protect the state eco-sensitive areas such as national parks, wildlife sanctuaries, reserve forests and coastal zones,

Reduce litter, sediment and pollutants entering waterways and the land,

Reduce noise, vibration and air emissions,

Minimise waste and dispose of it appropriately,

Use resources efficiently and reduce energy & material consumption,

Provide the safety of workers, road users and those in the neighbourhood,

Provide safe, clean and hygiene labour camps, if these are required,

Keep people affected by the construction activities regularly informed.

To operationalise these activities, a standard EMP (Appendix 1100.2) shall form a part of the PWD standard bid documents / contract agreements and shall be adhered to by the contractor who executes the work. PWD shall strive to ensure that the contractor's activities deliver quality construction without compromising on environmental performance. The standard EMP applies to the activities in construction site and ancillary activities such as the transportation of materials, sourcing of material and borrow areas. The contractor is responsible for ensuring all sub-contractors and any other people working on the project are aware of environmental issues and are in compliance to the EMP requirements.

In addition to the standard EMP, there are additional guidance documents such as (i) Guidance on Oxbow lands – Appendix 1100.3, (ii) Guidance on quarry and borrow area management – Appendix 1100.4, (iii) Guidance on Landscaping & Tree Species – Appendix 1100.5 and (iv) Guidance for Public Consultations – Appendix 1100.6. Wherever applicable, the PWD shall ensure that these guidance documents are used and measures are in practice. PWD shall provide cross-references to these guidance documents in the standard bid documents / contract agreements as required.

In the context of the regular works / projects, PWD shall review the standard EMP and other guidance documents in order to determine whether additional Bill-of-Quantities (BOQ) items are necessary to achieve good environmental performance. If required, PWD shall ensure that these additional BOQ items are included in the standard bid documents / contract agreements.

Documentary evidence shall be available to demonstrate compliance with the standard EMP. This can include periodic progress reports, file notes, audit reports, photographs, and minutes of meetings or video. The contractor shall retain them in safekeeping for perusal by the PWD.

Failure to reasonably satisfy and comply with the standard EMP requirements may result in the contractor receiving partial payment against the contract claims and also a noting in the contractor’s performance certificate.

1107. Conducting Environmental Impact Assessment (EIA) & preparing Environmental Management Plans (EMP) where required

For certain works / projects, separate environmental impact assessments have to be conducted. This may be due to the MoEF requirements or funding agency – such as the World Bank or Asian Development Bank – requirements. This may also be due to the possible impacts on eco-sensitive areas or due to the large scale environmental impacts across the state. In all such cases, separate environmental impact assessments (EIAs) will be conducted and relevant environmental management plans (EMPs) will be prepared.

EIA is an accepted planning tool, which is integral to project decision-making. The objective of EIA is to foresee the potential environmental problems that would arise out of a proposed development and address them in the project's planning and design stage. EIA integrates the environmental concerns of the project activities right at the time of initiating for preparing the feasibility report. With this process, the environmental concerns and mitigation measures can be integrated in project development. The stages in a typical EIA are as follows:

Screening	Screening is done to see whether a project requires environmental clearance as per the statutory notifications.
Scoping	Scoping is a process of detailing the terms of reference of EIA.
Baseline Data Collection	Baseline data describes the existing environmental status of the identified study area. The site-specific primary data shall be monitored for the identified parameters and supplemented by secondary data if available.
Impact Prediction	Impact prediction is a way of ‘mapping’ the environmental consequences of the significant aspects of the project and its alternatives. Environmental impact can never be predicted with absolute certainty and there is all the more reason to consider all possible factors and take all possible precautions for reducing the degree of uncertainty
Assessment of Alternatives, Delineation of Mitigation Measures and Environmental Impact Assessment Report	Possible alternatives shall be identified and environmental attributes compared. Alternatives shall cover both project location and process technologies. Alternatives shall consider ‘no project’ option also. Alternatives shall then be ranked for selection of the best environmental option for optimum economic benefits to the community at large. Once alternatives have been reviewed, a mitigation plan shall be drawn up for the selected option and is supplemented with an EMP for the implementation. The EMP is a crucial input to monitoring the clearance conditions and therefore details of monitoring shall be included in the EMP. An EIA report shall provide clear information to the decision-maker on the different environmental scenarios without the project, with the project and with project alternatives. Uncertainties shall be clearly reflected in the EIA report.
Public Hearing	Law requires that the public must be informed and consulted on a proposed development after the completion of EIA report.
Decision Making	Decision- making process involve consultation between the project proponent (assisted by a consultant) and the impact assessment authority (assisted by an expert group if necessary)
Monitoring of the Clearance Conditions	Monitoring shall be done during both construction and operation phases of a project.

Conducting EIAs and preparing EMPs are studies that are done by external consultants on behalf of the PWD. Taking into account the particular context of these works / projects, the PWD shall prepare terms of reference for conducting the EIAs and preparing the EMPs. PWD shall refer to the EIA Notification 2006 for information on various aspects of conducting EIAs, its knowledge of the state and

the dimensions of the proposed works / projects in preparing the terms of reference. The external consultants will be selected using the Government procurement procedures. Once mobilized, the external consultants conduct the studies and prepare reports that are to be reviewed and accepted by the PWD. Based on the report outcomes, the project planning and design shall be changed so that the environmental impacts are minimized.

EMP is a project specific plan with the following contents:

Table of preventive, mitigation and compensation measures (collectively referred as “management measures”) for all identified significant impacts at the pre-construction, construction and operational stages of the project; Guidance for preparing the management measures is included in Appendix 1100.7.

Organizational arrangements, training and capacity-building initiatives required to implement the management measures, and

Work program, time schedule and budgetary estimates.

An EMP may include construction safety management plans for high-risk events or events with potential for significant environmental damage such as fires, fuel spills or explosions.

In preparing the EMP, the PWD shall advise the consultants to refer to the Guidance for preparing project-specific EMPs (Appendix 1100.7) for major projects. This includes a typical table of management measures that need to be considered. In addition to the Guidance on preparing project-specific EMPs, there are other guidance documents such as (i) Guidance on Oxbow lands – Appendix 1100.3, (ii) Guidance on quarry and borrow area management – Appendix 1100.4, (iii) Guidance on Landscaping & Tree Species – Appendix 1100.5 and (iv) Guidance for Public Consultations – Appendix 1100.6. PWD shall provide cross-references to these guidance documents in the project-specific EMPs and standard bid documents / contract agreements as required.

In the context of these works / projects, PWD – with support from the external consultants - shall necessarily review the project-specific EMP in order to determine whether additional BOQ items are necessary to achieve good environmental performance. If these are required, then PWD shall make sure that BOQ items are included in the bid / contract documents.

Like other civil works, the project-specific EMP shall form a part of the contract agreement and shall be implemented by the contractor. Supervision of project-specific EMP implementation can be carried out by the PWD or given to Supervision Consultants (SC) based on the PWD capacity and the scale of the project. The contractor has to prepare his schedule for the physical implementation of the project-specific EMP and take periodic consent of the supervision authority as stipulated in the project-specific EMP. PWD has to ensure that the contractor obtains the necessary environmental clearances and also adheres to the project-specific EMP requirements through the pre-construction and construction stages.

After the construction stage is completed, the project-specific EMP will include activities during the operational phase. PWD shall ensure that these activities and ensure that the project-specific EMP is complied throughout the project cycle.

1108. Environmental management training & capacity-building

PWD will ensure that the induction and refresher training programmes cover environmental management as well. PWD’s Environmental Cell shall develop, establish and maintain training modules on a variety of environmental subjects that will include the following:

General awareness module on environmental issues in construction of roads, bridges and buildings;

Skill training on effective environmental planning and designing of roads. This will include issues such as avoidance of eco-sensitive areas, minimizing tree-cutting through proper choice of alignment, arranging for compensatory plantation,

Skill training on good environmental practices in construction camp management. This will include top soil storage, hot mix plant operation, WMM plant operation, and concrete batching plant operation, diesel dispensing station operation, labour camp management, workshop maintenance, waste management, and general housekeeping.

Skill training on good environmental practices in quarry and borrow management.

Skill training on managing tree cutting, transplantation, compensatory tree plantation and their maintenance, landscaping and oxbow land development.

Skill training on environmental management tools such as EIA, EMP, public / stakeholder consultations and environmental auditing.

Awareness training on environmental laws and their relevance to PWD activities.

PWD shall also identify staff within the Department who have the background or aptitude or interest or flair for environmental management issues, and develop them as trainers on environmental management issues. PWD shall organize specific train-the-trainer programmes for them, and also equip them with the required skills & facilities to effectively conduct training for other PWD staff.

PWD shall also periodically send its staff to training programmes on environmental management nationally and internationally.

SECTION 1200

1201. Social Impact Management

1202. Social Impact Assessment

Social impacts of development projects will have both positive and negative effects on individuals, households and the local community in particular and the society in general. Social impacts of development projects vary depending on the size and type of projects settings and the characteristics of the community affected. These may include potential changes to population, lifestyle, cultural traditions, community dynamics, and quality of life and well-being. Involuntary displacement induced by development projects has extreme social impacts, which in many cases warrant detailed and specific study leading to resettlement.

PWD recognizes the need to assess the potential social impacts of the projects and is committed towards responsible management of the same. These guidelines have been developed to assist Public Works Department officers in the management of social issues in planning and execution of its project.

The purpose of these guidelines is to

- Demonstrate and explain the process used in PWD to manage and protect the social values
- Provide guidance to PWD in managing social issues throughout the life cycle of the project
- Ensure transparency, predictability and accountability in its confirmation of social considerations.

These guidelines are applicable to all PWD projects and programmes related to the planning, design, construction and maintenance of road and buildings.

1202.1. Social issues and counter measures

Rehabilitation of roads as such may not cause significant adverse impacts but their upgrading (which involves widening of existing roads, construction of new roads/bypasses, realignments and junction improvement etc.) would entail acquisition of land and structures as well as adverse impacts on other assets, causing disruption of livelihood. Besides, it is likely that some Common Property Resources (CPRs) such as religious structures, passenger shelters at bus stops; hand pumps etc. may also be adversely affected.

Close examination of the social impacts of a project during the planning phase can enable such impacts to be avoided or minimised and suitable counter measures included in the project design. The extent of Social Impact Assessment necessary for the project will depend upon the type and size of the project and the size of the nature and scale of the potential impacts.

An R&R policy has been developed for PWD projects which is provided in annexure 1302A

Issues	Measures	When to Address		
		P	D	C
Acquisition of land and assets resulting in families being displaced or loss of livelihood causing discomfort. Stirring agitations and results in road blocks by locals. This gives negative impression of the project to local community, mistrust and lack of confidence arises which delays the project due to numerous reasons	Conduct Social Impact Assessment of affected community (ies) – access to houses, business, and farmlands affected and consider options for relocation, improvement, compensation.	P	D	
	Assess community facilities affected e.g., bus stop, playfield, water points	P	D	
	Develop time bound resettlement and rehabilitation action plan	P	D	
	Minimize disruption to social economic interaction	P	D	C
	Maximize potential benefit of development project	P	D	C
Severance of access roads to private or community properties,	Access roads are retained or approved		D	C

Destruction of social and cultural sites which have sentimental attachment or historical significance to the local community	Conduct survey of sites of social or cultural significance	P	D	
	Design project to minimize impact on sites of social/cultural significance		D	C
	Ensure construction works are managed to minimize/avoid impacts on identified sites		D	C
	Development of cultural heritage sites for promoting tourism		D	C
Loss of well being and amenity from construction activities, prolonged delays to construction or lack of information provided	Construction planning to manage and minimize identified impacts		D	C
	Public meetings, information bulletins etc to keep community informed of construction program and identify and address any issues arising	P	D	C
	Efficient construction practices		D	C

P- Planning Stage, D- Design, C-Construction,

1202.2. Social screening and scoping process (Categorization)

A project may be categorized into three; based on the impacted population. This exercise shall be carried out for all projects at project investigation stage. The social screening format is provided as Annexure 1202B

S-1: Projects are those that will affect 200 PAPs or more or if PAPs are physically displaced and will require a detailed Social Impact Assessment Report that would include a Resettlement Action Plan. These documents are to be submitted for approval by concerned EE and clearance by the Social Cell and the authority concerned for administrative /technical sanction.

S-2: Projects are those in which no PAP is physically displaced or less than 200 PAPs are affected. In this case a Social Management Plan (SMP) is required that would include an abbreviated resettlement plan

S-3: Projects, on the other hand will not have any households affected at all i.e, they can be classified as ‘socially benign’. However, submission of a Social Status Report is required.

All clearances for Technical sanctions would be accorded by social cell for all S-1 and S-2 categories after field verification/ audit of compliance with PWD R&R policy. Projects of Category-S-2 will require the same process and procedures of Category-S-1 but does not require administrative sanction. R&R policy is applicable to all project affected and entitled persons/families and establishments or institutions irrespective of the number of persons or families affected or displaced. The major difference is that Category S-1 projects, because of the manpower requirement may engage consultants to carry out the SIA and RAP. Similarly, for the implementation of the RAP of local NGOs with expertise may be engaged.

Impact Datasheet and Budget Formats to be attached with investigation report and Design Report is provided as Annexure 1202C and 1202D.

1202.3. SIA Process and contents

Social impacts can be defined as the consequences to people of any proposed action that changes the way they live, work, relate to one another, organize themselves and function as individuals and members of society. This definition includes social-psychological changes, trauma and stress changes in people’s values, attitudes and perceptions of themselves and their community and environment, over-crowding, infrastructure pressure, and poverty.

Social Impact Assessment (SIA) is a methodology to study the social effects of infrastructure projects and other development interventions using special tools to determine the social outputs, outcomes, or impact of an intervention program. SIA is concerned with the human consequences of development proposals, identifying all significant social impacts that arise in this context, giving particular attention to the mitigation of adverse or unintended aspects.

All stakeholders can anticipate benefits of the social impacts assessment:

1. Reduced impact on communities or individuals – identification of mitigation measures is an integral element of SIA.

2. Enhanced benefits to those affected – SIA preparation also helps identify measures such as job training packages;
3. Avoiding delays and obstruction – a well prepared SIA demonstrates that social impacts are taken seriously and helps to gain development approval;
4. Lowered costs – addressing social impacts and mitigation measures at an early stage helps to avoid costly errors and remedial actions imposed at a later stage by regulatory agencies;
5. Better community and stakeholder relationships – experience has shown that SIA can help to allay fear and concern and build a basis of trust and cooperation necessary for the proponent to successfully introduce and operate the project; and
6. Improved proposals – an SIA provides information that adds value to existing projects and helps to design future ones.

1203. Activities comprising Social Impact Assessment

SIA comprises most of the following activities. It:

- ❖ identifies interested and affected peoples;
- ❖ facilitates and coordinates the participation of stakeholders;
- ❖ documents and analyses the local historical setting of the planned intervention so as to be able to interpret responses to the intervention, and to assess cumulative impacts;
- ❖ collects baseline data (social profiling) to allow evaluation and audit of the impact assessment process and the planned intervention itself;
- ❖ gives a rich picture of the local cultural context, and develops an understanding of local community values, particularly how they relate to the planned intervention;
- ❖ identifies and describes the activities which are likely to cause impacts (scoping);
- ❖ predicts (or analyses) likely impacts and how different stakeholders are likely to respond;
- ❖ assists evaluating and selecting alternatives (including a no development option);
- ❖ assists in site selection;
- ❖ recommends mitigation measures;
- ❖ assists in the valuation process and provides suggestions about compensation (non-financial as well as financial);
- ❖ describes potential conflicts between stakeholders and advises on resolution processes;
- ❖ develops coping strategies for dealing with residual or non-mitigatable impacts;
- ❖ contributes to skill development and capacity building in the community;
- ❖ advises on appropriate institutional and coordination arrangements for all parties;
- ❖ assists in devising and implementing monitoring and management programs.

1203.1. Key elements of the full SIA process

1203.1.1. Scoping

Scoping identifies the type of the social impacts that are likely to be expected and clarifies the issues relevant to the project including the frames of reference; major issues; key variables to be considered; the geographical area of most importance and other areas of likely impact; the units of analysis and methods of measuring or determining impact; interested parties or stakeholders (including those who have vested interests in the project or the affected community, and other groups who will suffer any impacts from the development); and identification of community leaders and spokespersons from the stakeholder groups. Undertaking a literature review to identify previous studies of a similar nature to the proposed intrusion is an important step in the scoping process which should be commenced as early as possible. Scoping is largely conceptual process undertaken by the SIA task force with assistance from discussions with interested parties.

1203.1.2 Profiling

Profiling, sometimes considered to be part of the scoping process, involves gathering information about the community in the pre-impact state to be provided initial estimates for input into prediction models, and to provide baseline information with which to compare changes when they occur. Some of this data may already exist in the form of secondary data such as census and other government and community records, local histories, maps, newspapers and telephone directories. Otherwise, a social survey may be required to collect this essentially quantitative data. Interviewing long term residents is also a valuable source of information.

Attempt should be made to consider the nature of changes that are inherent in the cultural setting and likely to effect change on the community independent of the current development project. The likely impact of other development projects in the proximity of the current development and any cumulative impacts should be considered.

1203.1.3 Public consultation and participation

The SIA task force would use a variety of community involvement strategies such as public meetings and community workshops to hold public discussion of the type and nature of development in the analysis of specific development alternatives. Undesirable alternatives are discarded, and greater imagination can be applied to the range of possibilities available. The meetings would also determine whether the community should support the particular project being considered. The project would still require government approval.

1203.1.4 Mitigation, Monitoring and Management

The SIA task force by its involvement in the implementation planning of the development can make concrete suggestions that mitigate impacts and maximize the potential benefits accruing to the development. The actual mitigation and enhancement strategies will depend on the nature of the development and the nature of the impacts. The major task of the SIA task force is to identify the elements of the development that can be modified in order to reduce impacts. The impact itself is the result of a stimulus (the aspect of the development causing the impact) and a response (the way in which the community responds). It is possible to change or modify the nature of the community response, or its ability to adapt to new inputs, so that potential negative impacts can become positive or beneficial features of the development (Branch et al, 1984).

It is in mitigation that SIA is most useful, and where the science of SIA is most developed. There are a range of possible mitigation strategies that are applicable to almost all developments, or that are adaptable to suit the individual needs of the specific development proposal.

1203.1.5 Audit

Audit refers a review of the whole procedure of SIA as it was applied to the specific project. It is important to review predictions and in many cases predictions could be different to outcome because SIA has been successful in its role of mitigation and monitoring. Care needs to be placed on the interpretation of predictions at the assessment stage, and during any audit.

1203.1.6 Engagement of consultants

SIA is an inherently local activity. External consultants should be employed, but the success of SIA rests on a thorough understanding of the local culture and the way the culture responds to specific intrusions. It is vital that local expertise be used in the conduct of the SIA, and that information about each project be developed so that the lessons learnt from one SIA process can be applied to others as well. For projects in S-1 category external consultants may be engaged for preparation of SIA. Engagement of external consultants can also be done for conduction Audits. Services of local NGOs can also be hired for implementation of Resettlement Action Plan and Land Acquisition Plan.

1204. Selection of' Site for Acquisition

The work requiring the land to be acquired should have been administratively sanctioned and funds must have been provided. Unless otherwise ordered by the Government or Chief Engineer Administration & Designs the Officer competent to issue T.S. for the work concerned shall be the authority to make selection of site. When the P.W.D undertakes construction of buildings or other structures for other Departments, Local bodies etc., the responsibility for selection of site shall vest with the concerned Department or Authority, who may consult the officer of the P.W.D competent to issue T.S. for the work regarding the technical suitability of the site before finalising the site. The officer who selects the land is bound to see that the interest of government, the public and of private/ individuals likely to be affected are duly considered.

With regard to ascertaining the suitability it may be necessary to conduct some preliminary examinations, inspections or tests at site. These should be done with the consent of the owner, if he is willing, before moving for acquisition. The help of the officers of the Revenue Department may be sought in this regard. If, however, there is objection to these preliminary works being done, and if *prima facie*, the site appears suitable and necessary the Assistant Executive Engineer may move for land acquisition. In such cases, as soon as the notification under section 3(1) is published the necessary surveys and tests should be done.

1205. Unforeseen impacts

Any additional impacts identified during project execution shall be dealt with in accordance with the R&R policies. The check list of social impact shall be filled in and reported for calculation of entitlement and disbursement.



GOVERNMENT OF KERALA

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PART – II

WORK METHODOLOGY

1301. Project Preparation**1302. Introduction**

All works in PWD are classified into original works and repairs & maintenance. A project report is required for all works except emergencies, repairs and maintenance. For maintenance and repair works, the Executive Engineer shall submit proposals for the same to the Chief Engineer through the Superintending Engineer for consideration and approval.

Section 1400**1401. INVESTIGATION**

1402. General. It is most important that every work shall be properly investigated and all relevant data collected and correlated before finalizing the design and estimate for the work. Wrong choice of site or designs based on incorrect or insufficient data can result in considerable avoidable expenditure and delays. Hence maximum attention shall be given to investigation and furnishing of full and correct field data required. Modern equipments shall be used as far as possible.

Investigation may often have to be carried out in two phases; viz. preliminary investigation and detailed investigation. In the preliminary investigation phase, various alternative sites or alignments etc. shall be examined and a comparative study of the merits of the different alternatives possible to serve the purpose intended shall be made. Based on such study, the final choice of the site or alignment as well as broad features of the proposals shall be made. The financial implication of each proposal shall be looked into and the most economical one shall be finally recommended without sacrificing the technical feasibility. In the detailed investigation phase, all the data required for designing the work at the site or along the alignment finally chosen should be collected.

The Executive Engineer concerned shall decide whether the investigation shall be done by the department or entrusted to any other agencies considering the special nature and urgency of the work.

The Assistant Engineer will be responsible to conduct the preliminary investigations through the department investigation wing or through empanelled agencies with the approval of Executive Engineer i.e., he will indicate the various alternatives to be considered, and the preliminary data to be collected to enable a final choice, of site or alternate alignment. On the basis of the preliminary investigation, the Assistant Engineer must send a report to the Executive Engineer/ authority competent to issue technical sanction for the work, through Assistant Executive Engineer concerned, giving the comparative merits of the different alternatives studied and his own recommendations. The authority competent to approve the proposal shall then make a final choice of the alternatives examined, or if additional data is required, he shall call for the same. The economic aspect shall be looked into before the final selection. After the final choice is made, detailed investigation shall be conducted. The Design Engineer responsible for designing the work shall also inspect the site to acquaint himself with all the site conditions if found necessary. Wherever shifting of utility services is required the concerned department may be informed well in advance so as to enable them to take further steps for shifting the same.

In the case of works for the use of other Departments of the State, the Executive Engineer or the Assistant Engineer must keep the local officers of the respective Departments informed of the investigation work being done. The opinions of the officers of the concerned Department may also be taken into account in regard to choice of site and features required for the work. The onus for technical details however shall be vested with the P.W.D.

The benchmarks and survey reference points shall be carefully selected and properly established so that there is no likelihood of these being missed when the work is taken up for execution. Wherever possible, the benchmarks may be connected to the nearest permanent Mean Sea Level (M. S. L.) Bench Mark.

Funds for investigation shall be separately provided in the budget every year as lump sum provision. This provision shall be utilised for expenses in connection with the investigation. The competent authority shall approve the investigation estimate as per delegation of powers. If sub soil exploration is found necessary, this shall be mentioned in the proposal submitted for approval.

1403. Preparation of investigation reports

Based on the site investigation conducted the Assistant Engineer shall prepare and submit the investigation report in accordance with the provisions contained in the relevant codes and practices (IRC/IBC etc) and the same shall be submitted to the next higher authority for further necessary action and approval by the competent authority.

1404. Investigation for Road works

1404.1. Investigations, Design and Construction of new Pavements

The different classes of roads under PWD are National Highways (NH), State Highways (SH), and Major District Roads (MDR). Other District Roads and Village Roads in the State are currently under the control of LSGD.

1404.1.1 Investigations

The following Investigations are to be carried out during the planning stage, before the design and preparation of estimates and tender documents for the construction of new road pavements, both for new roads and for widening of existing carriageway. For more details refer (1) IRC:SP:19-2001, manual for Survey, Investigation and Preparation of Road Projects, First Revision (2) IRC: 37-2001 Guidelines for Design of Flexible Pavements, Second Revision (3) IRC:58-2002, Guidelines for Plain jointed Rigid pavements for Highways, Second Revision (Indian Roads Congress Publications)

- i) Topographic surveys and investigations for surface and sub-surface drainage requirements for the new road pavements.
- ii) Soil Survey, material surveys and laboratory tests (wet sieve analysis, liquid limit, plastic limit, IS Heavy/Modified Proctor compaction test, soaked CBR test on soil and specified tests on aggregates to be used in GSB and GB layers) to assess their properties and decision on the choice of different pavement materials/layers, their availability and location of borrow pits/quarries.
- iii) Traffic studies, particularly classified traffic volume of all heavy vehicles.
- iv) Axle load studies on heavy vehicles and evaluation wheel load distribution and design value of cumulative standard axle loads by conducting relevant studies on 20 percent sample or by making use of available/secondary data and assumed values of vehicle damage factors.

1404.1.2 Design and Drawings

- i) Study of various underground utilities present, if any and possible future requirements.
- ii) Design of sub-surface and surface drainage system.
- iii) Decision on type of pavement to be adopted on the entire road and on some identified stretches depending on site condition, problems pertaining to traffic and utility lines and cost considerations.
- iv) Design of total thickness requirement of selected type of pavement and the thickness and other details of the pavement layers (for flexible/ICBP/CC pavement) for the particular road stretch under consideration or a selected group of roads of identical features/characteristics. In the case of CC pavement, the details of transverse contraction and expansion/construction joints and longitudinal joints are also to be designed.
- v) Suggesting the specifications to be adopted and special materials/conditions/instructions such as compaction standards to be followed, equipment/machinery to be used, etc.
- vi) Preparation of working drawings for each road showing all the details including drainage system, cross drainage structures and the details of pavement layers, their levels etc.

1404.1.3 Preparation of Estimates and Tender details

The estimates, tender details and tender documents with all conditions of contract are to be prepared in conformity with the design and drawings prepared as above.

1404.2 Investigation for the Design, Estimation and Construction of Flexible Pavement Overlay on Existing Flexible Road Pavements

1404.2.1 Investigations

The following investigations are to be carried out during the planning stage, before the design, preparation of estimates and tender documents for the strengthening of existing road pavements/construction of overlay over existing road pavements. Refer IRC:81-1997. Tentative Guidelines for strengthening of Flexible Road Pavements Using Benkelman Beam Deflection Technique, First Revision (Indian Roads Congress Publication).

- i) Basic data on existing road, such as (a) road length (b) width of carriageway, shoulders/foot path, road side drains and if these vary at different stretches the details of the same (c) assessment of the present condition of the drainage system including the

- necessary maintenance works (d) history of the road construction and maintenance works undertaken in the past.
- ii) Topographic Survey and collection of data to obtain the details of surface and sub-surface drainage system for the existing road, including the reduced levels of longitudinal road side drains and cross drains up to the location for disposal of water from the road surface.
 - iii) Collection of details of the existing pavement layers by cutting open at least one trench across the pavement for at least half the pavement width, from one edge up to the centre line of the pavement, at a typical location. The trench may be about 0.3m in width and up to depth of 0.2 below the top of sub grade level. The details to be noted are : (a) type of each pavement layer and the thickness value (b) the condition of the existing bituminous surface course/courses – such as whether partially or fully cracked or damaged or stripping of bitumen has taken place, etc. (c) assessment of subgrade soil type, determination of field dry density (d) collection of about 30 kg of soil sample for testing (e) laboratory tests such as wet sieve analysis, liquid limit, plastic limit, IS Heavy compaction test and soaked CBR test.
 - iv) Additional tests, if required on the samples of bituminous mixes from surface course (such as bitumen extraction, bitumen content and aggregate gradation in the mix).
 - v) Traffic data, particularly classified traffic data of HCV (2-axle, 3-axle-rigid base, 3- and multi axle –articulated vehicles), LCV and bus traffic.
 - vi) Axle load distribution studies on classified heavy vehicles (as above)
 - vii) Pavement condition studies, such as : (a) pavement surface condition, indicating details/percentage cracked area, pot holes, rutting, undulations and longitudinal profile, cross slope, etc (b) Unevenness/Roughness index measurement by standard Bump integrator or any other reliable method.
 - i) Location of various utility/service lines such as underground drainage system, water supply pipes and various other utility services including electricity, telephone, cable system, etc and making provision for shifting /relocation of all/some of the service lines to edges of the road land and also ducting system to avoid road cutting across the road in future.
 - viii) Measurement topographical details/longitudinal levels along the pavement as well as longitudinal side drains and measurement of cross section levels at suitable intervals to prepare longitudinal and cross section drawings and to work out the quantity of materials required for profile correction.
 - ix) Decision regarding improvement of the subsurface / pavement drainage system for the existing road including widened portion, if any.
 - x) Structural evaluation of flexible pavement by Benkelman Beam Deflection studies ad per IRC: 81-1997.

1404.2.2 Design and drawing

- i) Design of pavement overlay thickness as per IRC: 81-1997
- ii) Design of overlay thickness and decision on the choice of overlay type and thickness of the layers.
- iii) Preparation of working drawings for each road showing all the details of the work to be carried out, including treatment at existing man holes etc.

1404.2.3 Preparation of Estimates and Tender Details

- i) Preparation of estimates as per the details of design and special materials, layers etc,
- ii) Preparation of estimates by considering (a) patching of pot-holes (b) patching of isolated cracked areas (c) cutting open and refilling badly filled up trenches which continue to settle down, leading to repeated formation of depressions or ruts-the existing pavement layer over the badly filled up trenches to be cut and removed including 300 mm depth of sub grade soil and refilled using cohesion-less and compacted using plate vibrator in two to three layers, and relaying of the other pavement layers similar to the existing pavement layers and (d) profile correction of existing pavement surface, as separate items.
- iii) Preparation of tender details and special conditions in conformity with the design and estimates.

1404.2.4 Bituminous Road construction

- a. The compaction of embankment/fill and sub grade adopted are as per Standard Proctor Compaction. This has to be upgraded to IS heavy compaction as per MoRTH specification. In fact, compaction in any granular/stabilised layer must refer to IS heavy compaction as specified in IRC/MoRTH specifications.

- b. In case of stabilization, in each case mix is to be designed separately and strictly followed.
- c. Coarse grade sub base materials as per MoRTH specification only should be used as per wet sieve analysis.
- d. For base course only WBM has been specified. For high density traffic corridors WMM or CRM etc are more appropriate for performance and constructability. IRC/MoRTH specifies 100mm for WBM-I (G-I) and 75 mm for WBM-II (G-II) and WBM-III (G-III).
- e. The specifications for materials e.g. aggregates and bitumen are lower (less strict for quality) than those recommended by MoRTH. For example, the water absorption, combined flakiness and elongation index, stripping value etc are much lower in case of aggregate, and similarly for bitumen quality.
- f. Priming and tack coat specifications are very elemental without much clarity; priming even allowing cut-back bitumen which is not allowed now except exceptional cases. Moreover, they are specified with excessive bitumen content per unit area in comparison with MoRTH specifications. Further, the use of pressure distributor is to be specified.
- g. Seal Coat type A and B are specified.
- h. DBM, SDBC, OGPC, MSS surface dressing etc are commonly used.

1404.2.5 Materials and Equipments

1404.2.5.1 Materials

The quality of materials leads to quality construction. Similarly the appropriate equipments are required for construction of road layer as per the specifications.

- i. Selection of materials shall be strictly as per IRC/MoRTH guidelines/requirements for the specific construction specifications.
- ii. There should be acceptance criteria for the materials also rather than only the quality control of construction specification. Materials should be rejected if not found to meet acceptance criteria.
- iii. Manufacturer's certificate shall not be considered in lieu of the tests. While contractor shall test at the site laboratory, the District level laboratory also should test samples randomly.
- iv. Use of alternate materials for various pavement layers are to be specified with details of their construction methods etc. For example, use of fly ash and slag in embankment/fill, subgrade and drainage layer, the demolished cement concrete for GSB layer, etc are to be promoted.

1404.2.5.2 Shoulders

Shoulder gives adequate side support to the pavement and also drains off surface water from the carriageway to the road side drain. Where side footpath is not constructed, normally a shoulder exists which needs appropriate construction and maintenance for proper functioning of the road.

- i. Shoulder is invariably neglected and remains without outward slope for efficient draining of surface water. This is of utmost importance in Mumbai where the rainfall is heavy.
- ii. The construction of shoulder is required to be done in layers each matching the thickness of adjoining pavement layer using selected earth/granular material. Only after a layer of pavement, shoulder shall be laid and compacted for same matching thickness; next corresponding layers in pavement shall be taken up, and then the shoulder. This procedure shall be followed upto the surface course.
- iii. The material, density and compaction shall be as per the specification of sub grade, where it is earthen shoulder; and the required cross-fall should be maintained.
- iv. Paved shoulders should have the specification consisting of sub base, base and surfacing courses and conforming to the relevant specifications of corresponding items for pavement layers.

1404.2.6 Qualification of bidders

1404.2.6.1 Any contractor registered in the appropriate class in PWD can bid for the works up to Superintending Engineers Powers of TS. Broadly there are two methods for works above TS Powers of Superintending Engineers (1) Prequalification and (2) Post Qualification.

1404.2.6.2 Pre-Qualification

In this method initially a notice is published to invite intending bidders to express their interest in bidding for the particular work. They are asked to furnish information on several points on the basis of which screening is to be done. Tender forms are issued only to those contractors who pass the selection criteria. In this system, the number and identify of tenderers who can bid gets frozen at the outset. Thereafter, the bids of all the bidders have to be opened and the work awarded straightaway to the lowest responsive bidder since every bidder is already screened. Sometimes, this system is not favored because it consumes a lot of time because of two notice periods once

for pre-qualification and then again for the bid proper and also each bidder knows who the other bidders are. It is also seen sometimes that an unworthy entity finds a place in the prequalified list. Proponents of the system, however, say that bidders chosen being entities of great stature there is no fear of a cartel being formed.

1404.2.6.3 Post Qualification

In this system the qualification criteria are set and put in the bid documents. The bidders are asked to supply detailed information on these criteria. The bids will be opened and bid of the lowest quoted bidder will be evaluated on the basis of such information. The employer will evaluate and compare only Bids determined to be substantially responsive. A substantially responsive bid is one which confirms to all terms, conditions, and specification of the bidding documents. The employer will award the contract to the Bidder whose bid has been substantially responsive to the bidding documents and who has offered lowest evaluated bid price.

In this system no bidder knows in advance as to who the other bidders are since any one can put in a bid at the last minute. However, the downside is that every bidder has to incur expenditure and effort to prepare a detailed bid whether he is going to qualify or not.

1404.2.6.4 Qualification Criteria

Refer SBD for works costing above TS Powers of Superintending Engineers.

1404.3. Road Alignment Considerations

The location or layout of the centreline of the road on the ground is called alignment. The alignment of road shall be decided only after conducting proper surveys and investigation. The horizontal alignment includes straight paths, horizontal deviations and curves. Changes in gradient and vertical curves are covered under vertical alignment of road.

In general, new roads will have to follow the existing cart tracks and other such existing alignments. The provisions of IRC SP 19 and IRC SP 48 shall be followed.

The ideal alignment between two points shall satisfy the requirement as given under:

- i. **Short:** It is desirable to have a short (or shortest) alignment between two terminal stations. A straight alignment would be shortest, though there may be several practical considerations, which would require deviations from the shortest path.
- ii. **Easy:** The alignment shall be such that it is easy to construct and maintain the road with minimum subsequent problems. Also, the alignment shall be easy for the operation of vehicle with easy gradients and curves.
- iii. **Safe:** The alignment shall be safe enough for construction and maintenance from the viewpoint of stability of natural hill slopes, embankment and cut slope and foundation of embankment. Also, it shall be safe for the traffic operation in terms of safe geometric features.
- iv. **Economical:** The road alignment would be considered economical only if the total cost including initial cost, maintenance cost and operational costs, is the lowest.
- v. **Sound:** The alignment shall be on the firm ground and shall not be susceptible to large settlement, deformation, landslide, etc.
- vi. **Aesthetics:** While selecting the alignment, the aesthetics of the area shall be borne in mind.
- vii. **Environment:** The alignment shall be decided giving consideration to environment protection, particularly in echo sensitive hill, forest areas and coastal zone areas. Tree cutting shall be avoided as far as possible while finalising the road alignment. Further details regarding environment aspect are provided in section 1100 (Appendix).
- viii. **Social:** Land acquisition and displacement shall be kept minimum

1404.4.4. Factors Controlling Alignment

The various factors, which control the road alignment, may be listed as:

a) Obligatory points: These are control points governing the alignment of the roads. These control points may be divided broadly into two categories:

- Points through which the alignment is to pass
- Points which the, alignment shall avoid.

Obligatory points through which the road alignment has to pass may cause the alignment to often deviate from the shortest path. The various examples of this category may be a bridge site, intermediate town, a mountainous pass or a quarry.

b) Traffic: In most of the cases, the people use certain routes traditionally. These may either be due to convenience, social connection with other areas, etc. The proposed alignment shall keep in view this traffic flow pattern. At the same time one shall also have a fair judgement of future trends in mind.

c) Geometric designs: Geometric design factors, such as, gradient, radius of curve and sight distance would also govern the final alignment of the road. As far as possible, steep gradient shall be avoided and limited to the ruling or design gradient. Thus, it may be necessary to change the alignment in view of the design, speed and maximum allowable super-elevation. It may be necessary to make adjustments in the horizontal alignment of roads keeping in view the minimum radius of curve.

The absolute minimum sight distance, which shall invariably be available in every section of the road, is the safe stopping distance for the fast moving vehicles. Also, there shall be enough distance visible ahead for safe overtaking operations of vehicles. Hence, the alignment shall be finalised in such a way that the obstructions to visibility do not cause restrictions to the sight distance requirements.

d) Economy: The alignment finalised based on the above factors shall also be economical. Avoiding high banking, deep cutting, major crossing and balancing of the cuts and fills can decrease initial cost of construction. At the same time, care shall be taken to see that it is not likely to involve costly maintenance and operational expenses. The vehicle operating costs may be given due consideration while designing the alignment.

e) Drainage and Other considerations:

Various other factors that may govern the alignment are drainage considerations, hydrological factors, social obligations, etc. The vertical alignment (particularly the gradient and change of grade) is often guided by drainage considerations. The sub-surface water level, seepage flow and high flood level are also the factors to be kept in view.

f) Special Consideration for Hill Roads

For selection of road alignment in hilly area, reference may be made to Hill Roads Manual (IRC: SP: 48). In hill roads, additional care has to be taken for ecological considerations, such as:

- (i) Stability against geological disturbances
- (ii) Land degradation and soil erosion
- (iii) Destruction and denudation of forest
- (iv) Interruption and disturbance to drainage system
- (v) Aesthetic considerations
- (vi) Siltation of water reservoirs

1404.5. Surveys

Final location of the alignment is based on ground verification, and therefore, the engineering surveys are to be carried out. The surveys may be completed in four stages as below:

- (i) Reconnaissance
- (ii) Preliminary Survey
- (iii) Determination of Final Centre Line
- (iv) Final Location and Detailed Survey

To facilitate the survey team in the tentative selection of alternative alignments for subsequent detailed ground reconnaissance, it will be advisable to make use of modern techniques like, aerial survey, photogrammetry and remote sensing.

1404.5.1. Reconnaissance Survey:

Keeping in view the obligatory points the next step will be to undertake reconnaissance survey in the following sequence:

- Study of topographical survey sheets, revenue maps, geological and meteorological maps, and aerial photographs or GIS maps where available
- Preliminary aerial survey/ satellite imagery reconnaissance (as against Aerial Photographs), where practicable and feasible.
- Ground reconnaissance
- Final reconnaissance of inaccessible and difficult stretches

1404.5.2. Preliminary survey:

The preliminary survey is a relatively large scale instrument survey conducted for the purpose of collecting all the physical information which affects the proposed location of a new highway or improvements to an existing highway preliminary surveys include census surveys, traffic surveys, soil and material surveys, topographic surveys and drainage studies.

The main objectives of the preliminary survey are:

- (i) To survey the various alternative alignments proposed after the reconnaissance and to collect all the necessary details of topography, drainage and soil.
- (ii) To compare the different proposals in view of the requirements of a good alignment.
- (iii) To estimate the quantity of earthwork, materials and other construction aspects and to work out the tentative costs of alternate alignments.
- (iv) To finalise the best alignment from all considerations.

The survey procedure and map preparation is explained in IRC SP 19.

1404.5.3. Determination of final centre line:

Making use of the maps from preliminary survey showing the longitudinal profile, cross-sections and contours, a few alternative alignments for the final centre line of the road are drawn and studied and the best one satisfying the engineering, aesthetic, environmental, social and economic requirements is selected. Horizontal curves are designed and the final centre line is marked on the map. The vertical curves are designed and the profile is then determined.

1404.5.4. Final location and detailed survey:

The alignment finalised after the preliminary surveys is to be translated on the ground by establishing the centre line. The line to be established in the field shall follow as closely as practicable the line finalised after the preliminary survey and conforming to the major and minor control points established and the geometric design standards. However, modifications in the final location may be made in the field if necessary.

1404.5.5 Preparation of investigation report

For preliminary project report and DPR preparation of road projects of National Highways, State Highways and MDR, provisions and guidelines contained in IRC SP 19 and other IRC codes, shall be followed. Preparation of social impact assessment using the instrument and check list given in **Annexure 1202C**.

1405. Investigation for Bridges

The investigation for bridges shall be done as per the IRC SP 54 and IRC Codes named in Section (Appendices).1512, Bridges on State Highways, Major District Roads and Other District Roads, shall be designed at the **design wing** as far as possible.

1405.1. Selection of sites

Adequate efforts made in selection of a good site for locating a bridge will be amply rewarded in the form of reduced cost of the project and trouble free performance of the bridge. The cardinal principles to be kept in view at the time of selection of a particular bridge site including river training works are to provide a suitable crossing consistent with safety and economy and acceptable detour from the existing road alignment.

1405.1.1. Factors deciding site selection:

The site of a bridge shall be carefully selected after considering the following points: -

1405.1.2. Presence of high and stable banks:

The presence of high non-erodable banks generally offers an ideal site, which reduces the cost of approach embankments and their protection works.

1405.1.3. Narrowness of the channel and large average depth compared to maximum depth:

This ensures large average depth of flow compared to maximum depth of flow and reduced waterway, which greatly reduces the overall cost of the bridge structure.

1405.1.4. Presence of good founding strata at shallow depth:

A site, which requires a shallow foundation, shall be preferred to one, which may require a deep foundation.

1405.1.5. Straight reach of the river u/s and d/s of the proposed site:

The course of river or stream over which the bridge is constructed shall have a straight reach for at least 100 metres on either side of the proposed crossing. Straightness of the reach both u/s and d/s ensures uniform distribution of discharge/velocity. Curvature in the stream especially on the u/s leads to obliquity and concentration of the flow on the convex side leading to higher scour, and consequent cost of foundation and protection works. If the bank on the convex side is erodable, it may lead to heavy recurring expenditure in protecting the abutments and the embankment on that side.

1405.1.6. Possibility of right angled crossing:

Right angled crossing offers minimum possible bridge length and reduces chances of obliquity of flow with respect to the substructure.

1405.1.7. Possibility of good approach alignment:

Curves except gentle one are preferably to be avoided on approaches and bridge proper from visibility and safety considerations. The approaches on both sides shall have a minimum straight reach of 15m for major bridges and 10m for minor bridges. Also steep gradients shall be avoided on approaches.

1405.1.8. Where existing two-lane highway is proposed for widening to four-lane:

The additional two-lane bridge shall be sited as close to the existing bridge as possible. However, in case of bridges having well foundations, distance sufficient for generation of passive resistance of soil shall be provided.

Although it may not be feasible to satisfy all desirable attributes simultaneously, the selected site shall represent the most desirable mix of the attributes consistent with overall economy, including the cost of approaches. Sometimes more than one site may have to be examined at the preliminary stage and comparisons made regarding cost and relative advantages and disadvantages. Based on such study, the final choice of site shall be made.

1406. Investigation for Major and Minor Bridges

Investigation for Major and Minor Bridges shall be done as per the provisions in IRC SP 54

1406.1. Sub-surface investigation:

The objective of sub-surface exploration is to determine the suitability of the soil or rock, for the foundation of bridges. The sub-surface investigation for bridges is carried out in two stages, namely, preliminary and detailed. Sometimes, it may require additional/confirmatory exploration during construction stage.

Guidance may be taken from the following:

- (i) IS1892 – Code of Practice for Site Investigation for Foundations may be utilized for guidance regarding investigation and collection of data.
- (ii) Test on soils shall be conducted in accordance with relevant parts of IS: 2720 – Methods of Test for Soils. The tests on undisturbed samples to be conducted as far as possible at simulated field conditions to get realistic values.
- (iii) IS: 1498 – Classification and Identification of soils for general engineering purposes.

1406.2. Preliminary Investigation:

Preliminary investigation shall include the study of existing geological information, previous site reports, geological maps, etc. and surface geological examination. These will help to narrow down the number of sites under consideration and also to locate the most desirable location for detailed sub-surface investigation. If the bridge site is pre-determined due to other reasons, the preliminary investigation is not necessary and shall straight away conduct the detailed investigation.

1406.3. Detailed Investigation:

Based on data obtained after preliminary investigations, the bridge site, the type of structure with span arrangement and the location and type of foundations, the programme of detailed investigations, etc. shall be tentatively decided in consultation with the **Chief Engineer**. If preliminary investigation is not conducted, the Assistant Engineer shall decide a suitable interval, not greater than 20 metres along the alignment for taking trial pits/bore holes. The exploration shall cover the entire length of the bridge and

also at either end a distance of zone of influence, i.e., about twice the depth below bed of the last main foundation to assess the effect of the approach embankment on the end foundations. Generally, the sub-surface investigations shall extend to a depth below the anticipated founding level equal to about one and a half times the width of the foundation. However, where such investigations end in any unsuitable or questionable foundation material, the exploration shall be extended to a sufficient depth into firm and stable soils or rock.

1406.4. Preparation and Submission of Investigation Report

The abstract of the investigation details and design data shall be prepared as per the provisions in section 1403 and IRC SP 13 and IRC SP 54. The competent authority shall forward the report to the Chief Engineer Administration & Designs after verifying and making suitable modifications required, if any.

1407. Investigation for Buildings

1407.1. General

In areas which have already been developed, advantage shall be taken of existing local knowledge, records of trail pits, bore holes, etc, in the vicinity, and the behaviour of existing structures, particularly those of similar nature to those proposed. If the existing information is not sufficient or inconclusive, the site shall be explored in detail so as to obtain knowledge of the type, uniformity, consistency, thickness, sequence and dip of strata and of the ground water conditions.

1407.2. Selection of site;

The **Chief Architect & Chief Engineer (Buildings)** shall approve the site for any Government building.

Wherever master plans for town or country development have been prepared or are under preparation the District Town Planner or the Development Authority having jurisdiction over the area may also be consulted before finalising the selection of site.

In selecting a site the following desirable features shall be kept in view.

- (a) The neighbourhood must be suitable for the purpose for which the building is to be constructed.
- (b) The site must be easily accessible from the main roads and important institutions.
- (c) As far as possible other buildings of no consequence in the locality shall such that the building constructed in it is not hide the site.
- (d) The site must be fairly level or gently undulating without steep slopes, rock out-crops, abandoned laterite or rock quarry pits etc.
- (e) The site must not be subjected to water logging and shall be capable of easy drainage.
- (f) The subsoil shall be hard enough to provide good foundation at reasonable depth.
- (g) It shall be possible to locate sources of drinking water for use of the occupants either at the site or within reasonable distance there from:
- (h) The site shall have good ventilation. At the same time it shall not be exposed to heavy wind without any protection.
- (i) The site shall not contain places of worship, graveyards, monuments, or any other structure or feature of religious or sentimental value whose demolition may cause offence to any section of the population.
- (j) For building in the vicinity of airports aviation clearance may be sought.
- (k) The site shall have minimum displacement of residences and livelihood

If more than one site is available, the relative merits of the several sites shall be examined before a final choice is made.

1408. Investigation and field data to be furnished

Wherever available, previous investigation reports may be utilised as also the local knowledge. Reference may be made to geological and agricultural soil maps if available. Where these are inconclusive, site exploration may be required. Refer IS 4453: 1980 code for site exploration.

There shall be an index map showing the site in relation to the nearest public road, railway line and important institutions in the neighbourhood. The index plan may be a tracing from the village map or town map or a good sketch containing the information required.

A detailed site map may be prepared showing the boundaries and ground features as well as structures if any, trees of more than one metre girth, abandoned laterite quarries wells etc. It shall also

show portions of adjacent property, and structures if any, abutting or close to the site. Spot levels shall be taken throughout the site so that contours at 1-metre intervals can be plotted. The existing natural drainage courses within the property if any as well as outside shall be marked. The approach road to the site up to where it joins any public road shall also be surveyed and marked. A few cross sections shall also be taken at convenient intervals. The survey may be done with a plane table or chain in small areas, and with theodolite triangulation or suitable electronics devices in larger plots. A reference line shall be established at a suitable place in the plot. It shall be permanently fixed by means of concrete blocks at its extremities. One or two permanent B. Ms. shall be established. The reference line and the B. Ms. shall be marked in the site survey. The north point shall also be marked. The site survey shall be of a scale not smaller than 1 cm = 10 m. The preliminary investigation details are forwarded to the architectural wing for preparing layout.

A report containing information on the nature of soil and subsoil and the bearing capacity etc. shall be submitted. The location of the trial pits and boreholes shall be marked in the site survey. It is desirable that the Executive Engineer inspects sites where foundations are poor and indicates the number and location and minimum depth of bore holes to be taken. It is necessary that the samples of soil obtained from boreholes are taken and sent for examination. Where undisturbed samples are required, other approved laboratory may be consulted. Where test piles are done to ascertain the bearing capacity, the results shall be included in the investigation data. The investigation report must also include details on the following:

- i. The subsoil water level during rainy season and dry season shall be observed and recorded.
- ii. Maximum flood level expected in the locality.
- iii. Direction of prevailing wind during different season.
- iv. Source of water supply for construction as well as for use when the building is occupied.
- v. If there is electric supply in the vicinity, the distance of the nearest point from which power supply has to be tapped.
- vi. The source from where the principal construction materials like stones, bricks, metal, lime etc. are to be procured.
- vii. Distance of building/ bridge from water front/ beach so as to be in conformity with the CRZ regulations
- viii. Present condition of existing buildings/ bridges in the vicinity with respect to corrosion induced distress.

The investigation report is also forwarded to the design wing for detailed design.

Sections 1500

1501. STRUCTURAL DESIGN

1501.1. Layout and Structural Designs:

The competent authority as prescribed in the delegation of powers shall approve the design of any kind of structure before the detailed estimate is prepared. The Assistant Engineer/Assistant Executive Engineer and the Executive Engineer shall personally inspect the site and see that the proposed design can be implemented on ground.

The Chief Engineer Administration & Designs may, if required, entrust the design to an empanelled consultant as he deems it fit to the context. If the Chief Engineer Administration & Designs feels that proof checking is required, he may do so either through Designs Wing or through another approved agency. Detailed design in all such cases shall be accepted by the Chief Engineer Administration & Designs and communicated to the authority that has referred the design. The priority for the design work shall be fixed by the concerned Chief Engineer and communicated to the Chief Engineer (Administration & Design).

For details regarding design methodology refer Appendix – 1500.

Section 1600

1601. ESTIMATES

1601.1. Types of Estimates

All proposals for expenditure on works and on tools and plant in the PWD should be presented in the form of one or other of the following estimate, for scrutiny by the authority competent to sanction the same. The estimate shall be prepared using software developed by the department. The software shall contain provision for quantity survey, data preparation with schedule of rates and local market rate,

provisions for online submission and approval of estimates and other features required. The software shall be updated as and when required.

- (a) Preliminary Estimate
- (b) Detailed Estimate
- (c) Recast Estimate
- (d) Working Estimate
- (f) Supplementary Estimate
- (g) Revised Estimate

1601.1.1. Preliminary Estimate.

Preliminary estimate shall be submitted for works costing up to Rs. 2.00 crore, beyond which detailed estimate shall be submitted in order to accord administrative sanction for all works, except those mentioned in section 1801.1.1. All plan and non plan works shall be initiated only through a preliminary estimate. This is prepared to form a reasonably accurate idea of the probable expenditure and also the essential features of the proposal, at a stage where the necessity or the general desirability of the works proposed has not been decided upon by the competent authority.

Preliminary estimates for works shall be prepared by the Assistant Engineer based on site inspection with the help of Overseer and based on Schedule of rates in force. The Assistant Engineer shall verify the provisions and ensure that they are adequate and as per appendix 1600A before forwarding it to his superior officer for issuing administrative sanction. In the case of buildings, Electrical wing shall prepare Rough cost estimate for electric works and forward the same to the concerned Executive Engineer of buildings wing for incorporating the same in the preliminary estimate.

The preliminary estimate must contain a report, giving information on all aspects of the work for satisfactory completion, with specifications, and justification for the work. It must also include the details of site conditions, with site plan and layout drawings.

In the case of buildings, the concerned Administrative Department may also be consulted. Where the help of the Architect is necessary he may be approached through the Chief Engineer Administration & Designs. Above all the preliminary estimate must be accompanied by a certificate from the Assistant Engineer stating that “ I, the undersigned hereby certify that this preliminary estimate has been prepared by me after site inspection and the provisions included are essentially required and adequate for the proper completion of work”.

Examples of preliminary estimates in respect of a road, a bridge and a building work are illustrated in Appendix 1600B.

The preliminary project report (PPR) for Administrative sanction should contain the following:

1. Docket Sheet as per Appendix 1600C
- 2 Site plan (also a District index map)
- 3 Typical plans/ cross sections (standard drawings of proposed work)
- 4 Preliminary Estimate (as per Appendix 1600A)
- 5 Land Availability/ certificate
- 6 Certificates signed by AE (as mentioned above)

In the case of works exceeding TS powers of Superintending Engineer detailed estimate is required for which competent authority shall approve an investigation estimate.

1601.1.2. Detailed Estimate

Detailed estimate as per a Appendix 1600D shall be submitted in order to accord Technical sanction for all works This shall be prepared after detailed investigation of the site by the concerned authority assisted by subordinate officers and on the basis of detailed designs and specifications for the work including source of supply and cost of different materials, cost of labour, hire charges of tools and plant, if any etc. Proper care shall be bestowed on the preparation of a detailed estimate so that it reflects as faithfully as possible the cost of work as can be foreseen at that time.

Detailed estimates for works shall be prepared by the Assistant Engineer based on approved layout and designs and on the schedule of rates in force. Actual conveyance shall be adopted for all estimates. Detailed checking of the estimate shall be done only in the office of TS Issuing Authority. Intermediate officers shall record their views and suggestion in the docket sheet accompanying the estimate. All estimates received in an office shall be forwarded to the higher offices within seven days, if

the estimate amount exceeds the power of sanction. Subordinate technical staff shall obtain written orders of the head of office before effecting corrections other than arithmetical errors in the detailed estimate.

The detailed estimate for a work consists of seven parts, viz.-

- i) A docket sheet covering the estimates as per Appendix 1600C
- ii) A report containing the following particulars:-
 - a) The justification for the work.
 - b) The location of the work or works concerned and the available approaches to the same.
 - c) Salient features of the proposal.
 - d) The total cost. (in the prescribed format)
 - e) If, after completion any operating cost is likely to be involved, the approximate cost of operation.
 - f) The extent of land acquisition and problems if any connected with such acquisition.
 - g) The approximate time required for completion.
 - h) Any special problems regarding execution of the work.
 - i) The economic aspects of the scheme, i.e., the cost as compared with benefits derived.
 - j) A detailed realistic programme chart for execution
 - k) A certificate signed by an Assistant Engineer as stated above.
- iii) Plans and designs of Works
- iv) Details of quantities of different items of work involved based on the design and drawings.

Normally every item included in the estimate shall conform to the relevant clauses of standard specification for road and bridge works of MoRTH published by Indian Roads Congress in the roads and bridges and to the National Building Code in the case of buildings. Where items, which are not covered by standard specification are involved, the description of the item shall be full and clear.

- v) A data sheet showing the 'estimated unit rate for the different items of work.
 - a) **For road and bridge works:-** the estimate shall be prepared as per the Standard Data Book for the analysis of rates (MoRTH) published by IRC. (available software can be utilised)
 - b) **For buildings: -** The estimate shall be prepared as per relevant IS codes, National Building Code 2005 and the Kerala Municipal Building Rules.
 - c) Work done through contract agency, the data shall make a provision for contractor's profit at 10% of the net cost of the items less cost of departmental materials, if any, supplied. If items not included in the schedule of rates are included in an estimate, the data for unit rate shall be worked out based on the market rate for the item or its components. The market rate shall be ascertained by making local enquiries in the most suitable manner found expedient
 - d) The district average conveyance shall be adopted for preparing estimates of all works.
- vi) An abstract giving the description of the different items involved and the total quantities, the unit rate and the cost of each item. To the total of the several items as per this abstract 2.5% is added to cover the cost of contingencies. This abstract shall also give the total quantities of materials to be arranged for as departmental supply.
- vii) Costing towards mitigation of environmental damages shall also be included either as a part of civil work (5- 7 % of cost of work) or as a separate item of BOQ

As far as possible lump sum rules (LS) shall be avoided in a detailed estimate except for petty items the total of which shall not exceed 5% of the estimate. L. S. provision is also permissible in case of items whose details cannot be foreseen at the time of preparation of the detailed estimate or where it is proposed to work out the details later on. In such cases working estimates shall be prepared against these lump sum provisions as soon as the details can be known, before the L. S. are operated on. Such working estimates will be treated as part of the detailed estimate.

1601.1.3. Working Estimate

A working estimate is intended to give the details of the works and the cost thereof, which are to be carried out against a L. S. provision made in an estimate. Normally therefore, the working estimate shall not exceed the amount of L. S. provision in the estimate for the main work. If however, it is not possible to limit the cost of the works included in the working estimate to the L. S. provision, care shall be taken when sanctioning the working estimate that the overall excess is within the powers of the authority sanctioning the working estimate.

Working estimates shall be prepared with the same care as in the case of detailed estimate. It shall be as realistic as possible. If the works as per the working estimate are to be entrusted to the contractor for the main work' then the rates to be included in the working estimate shall be his quoted rates for agreed-items and rates worked out as per his agreement for allied and extra items. In cases where a different agency can be entrusted with the works as per the working estimate, the rates to be adopted shall be based

on the schedule of rates prevalent at the time of preparation of the working estimate and on the market rates where there is no schedule item.

In respect of projects, working estimates shall be sanctioned by subordinate officers only after consultation with the authority under the control of the project, to whom a copy of the sanctioned working estimate shall also be sent. The authority under the control of the project shall maintain a register of all working estimates sanctioned against each particular sub head of the project estimate, to see that the provisions in the sanctioned project estimate are not exceeded. Each working estimate shall be treated as a detailed estimate for exercising the powers of sanction.

1601.1.4 Recast Estimate

It may sometimes happen that after the estimate for a work has been technically sanctioned but before it is taken up for execution some changes are found necessary in the estimate for the work. In such cases a fresh estimate may be prepared and got sanctioned in cancellation of the originally sanctioned estimate. This fresh estimate is called a recast estimate and is dealt with as if it is an original estimate. If however, before a recast estimate is prepared some expenditure has been incurred in an originally sanctioned estimate, then this procedure cannot be followed and instead a revised estimate shall be prepared and got sanctioned.

1601.1.5. Supplementary Estimate

Any development or extension of a work though necessary while the work is in progress which is not fairly contingent on the work as first sanctioned must be converted by a supplementary estimate. In effect this supplementary estimate is an original estimate for the additional works consequent on the development or extension of a project or work under execution. Administrative sanction shall therefore be obtained for the supplementary estimate from the same authority, which sanctioned the original estimate even if the cost can be met from savings in the original estimate. The competent authority in this case is the authority that is empowered to accord administrative sanction to the work as a whole, i.e., including original and supplementary estimates.

The following particulars shall be invariably furnished when submitting supplementary estimates for sanction.

- a) A full report of the circumstances justifying the need for the supplementary estimate.
- b) The amount of the original estimate and the amount of supplementary estimates already sanctioned, if any, and the amount of the supplementary estimate for which sanction is sought. Each supplementary estimate to any original estimate shall be numbered consecutively as first supplementary estimate, second supplementary estimate and so on for easy identification.
- c) The supplementary estimate shall be prepared in the same manner as an original work and all details and drawings furnished.

When a supplementary estimate is sanctioned the original estimate amount stands enhanced to the extent of the amount of the supplementary estimate.

1601.1.6. Revised Estimate

A revised estimate must be prepared and got sanctioned:

- (a) When there are deletions, additions or alterations to the scope of the work as originally sanctioned needing revised administrative sanction.
- (b) When there are major structural alterations from the design as originally sanctioned.
- (c) When the cost of a work is likely to exceed by more than 5% of T.S amount.

The revised estimate shall not be kept waiting till the work is completed or reaches an advanced stage of completion but shall be prepared and got sanctioned as soon as any of the above two conditions are anticipated during, the course of execution of work

A revised estimate will consist of-

- i. A variation statement in form No. Appendix 1600E indicating briefly the nature and reasons for the main variation and the financial effect of the variations.
- ii. A comparative statement (in Form No. D. B. 4)-Appendix 1600F giving the quantities, rates and amount of the items as per original estimate and as per the revised estimate with the reasons for the variation of each item. It is not necessary that the comparative statement shall repeat such items of the original estimate, which are not affected by the revision, but these items shall be grouped together under the several heads as per the estimate and noted as unaffected. The affected items shall be shown in detail in the comparative statement.
- iii. The basis for sanction of revised estimate shall be T.S amount.

1601.2. Estimate of National Highways

National Highways are the responsibility of the Government of India and the State P.W.D. Acts as the agent of the Government of India for investigation, construction and maintenance of National Highways. Agency charges fixed from time to time will be added in the estimate to cover the cost of establishment.

For original works chargeable to National Highways, the designs shall be sent for technical scrutiny and comments, to the Government of India, Ministry of Road Transport and Highways (MoRTH). After it is cleared technically, the executing agency shall prepare a detailed estimate but forward only the general abstract of cost along with detailed information to the central government for accord of administrative approval. The executing agency shall accord technical approval and financial sanction to the detailed estimate already prepared within 3 months from the date of according administrative approval by the central government and shall commence execution of works within one year from the date of according administrative approval failing which the Administrative approval accorded by the central government shall stand cancelled automatically and executing agency shall approach central government for fresh administrative approval for the said work.

For any original works on National Highways, detailed estimate of the cost of execution of work shall be forwarded by the executive agency to central government for obtaining technical approval and financial sanction. The Chief Engineer, National Highways in the state will be competent to accord technical sanction based on technical approval received.

When an estimate for NH original work sanctioned by the Ministry needs revision and the amount of the revised estimate exceeds the original estimate by more than 5%, sanction of Government of India shall be obtained for the revised estimate. Regarding estimate for maintenance of National Highways it is necessary to give particulars of the year's requirements under this head to the Ministry of Transport before the commencement of the financial year. On receipt of sanction from the Ministry, detailed estimate for individual portions of works as approved by Government of India may be prepared and sanctioned by the officers of the P.W.D. subject to the normal limits of powers of Technical Sanction.

1601.3 Works in Raj Bhavan

The expenditure of works in Raj Bhavan is a charged one, ie, the expenditure that could be included in the consolidated fund without the vote of the legislature. The limit of expenditure is as prescribed in the third schedule to the State Re-organisation (Governor's allowance and privileges) Order 1975 as amended from time to time. The Controller, Governor's household, who will also allot the required funds, shall accord administrative approval for the estimate of all new works in Raj Bhavan.

The competent officer of the P.W.D will accord technical sanction for all works. No centage charges will be levied for the same.

L.S. amount will be provided in annual budget for the maintenance of Raj Bhavan and this will be operated by the Chief Engineer in consultation with the Secretary to the Governor.

1601.4. Deposit Works

In the case of deposit works for private parties before plans and estimates are prepared and made available to the party, centage at 2.5 % shall be, got deposited. To start with an approximate figure of cost may be assumed for the estimate and the 2.5 % centage realised based on this approximate figure subject to adjustments after estimate is prepared. In case the work is carried out by the P. W. D., the estimate shall include a total centage of 12.5 % including the 2.5 % for preparation of plan and estimate. Technical Sanction, for the estimate may be given by the officers of the P. W. D. subject to the limit of their powers after.

- (a) The party accepts the Estimate
- (b) Deposits the estimate amount (including centage)
- (c) Undertakes to make additional deposit to the extent necessary in the case the estimate amount is exceeded during actual execution.

In the case of works undertaken for local bodies and quasi government organisations and Government of India works it is not necessary to insist on 2.5 % prior to preparation of estimate provided the concerned local body or quasi government organisation agree to pay the percentage after the estimate is finalised. It is, however, necessary to insist on fulfilment of conditions (a), (b) & (c) above before the estimate is technically sanctioned and work arranged except in the case of local self governments where no percentage is leviable for the preparation of estimates by the P. W. D.

The P. W. D. shall carry out all civil works for every Department of Government but this requires provision of funds for the concerned work in the P. W. D. budget. It may, sometimes, happen, that another department of Government requires the P. W. D. to carry out some works provided in that Department's budget. Such works when carried out by P. W. D. are to be treated as deposit works and any centage shall not be added to the estimate. The rough cost estimate shall then be sent to the concerned department for administrative sanction and funds.

1601.5 Annual Maintenance and Repairs Estimate

A separate estimate shall be prepared annually for all anticipated ordinary repairs of each building or road/ bridge work or group of such works during the working year. No administrative sanction is required for maintenance and repair works.

- (a) The original Typical Maintenance Estimates (TME) and the changing TME due to modifications in the plan of buildings shall be approved by the Chief Engineer (Buildings)
- (b) Subsequent change in TME due to schedule revision shall be approved by the Executive Engineer (Buildings)

The Chief Engineer/Executive Engineer shall accord approval subject to availability of funds and necessity. Estimates for maintenance work are dealt with in Section 2500, Asset Management and Sections 2600 to 2800.

SECTION 1700

1701. SCHEDULE OF RATES

PWD schedule of rates shall be followed by all the government departments/ Quazi government organisations while preparing the estimate for works funded by the State Government. All estimates shall be prepared based on actual conveyance. SoR shall be updated every year with effect from 1st April. For this purpose there shall be a Committee consisting of senior level officers of PWD, KWA, KSEB etc constituted by Government. The Chief Engineer (A&D) will be the convener of the Committee. The Committee will finalize the SoR for approval of Government. The Chief Engineer (A&D) shall publish in the Web Site before 15th March.

The source for various construction materials shall be fixed by the Chief Engineer A&D on 1st April once in every 5 years based on the proposals submitted by the Executive Engineers Buildings of each district for periodical revision of Schedule of Rate.

1701.1 Data Book

MORTH data as per IRC Guide lines for roads and CPW D data and National Building Code for buildings shall be adopted.

1702. Plinth Area Rate

The plinth area rates shall also be revised by the Chief Engineer A&D every year along with revision of SoR.

1703. Local Market Rate

The Executive Engineer Buildings of each district shall fix local market rates for materials and labour twice every year. The rates shall be fixed as on 1st April and 1st October every year. These rates shall be followed by Executive Engineers of all wings for preparing local market rate justification estimate for tender approval. The justification estimate shall also include 10% contractors profit and 5% overhead charges. The justification estimate shall be submitted to the tendering authority directly by the Assistant Engineer before the date of opening of tenders.

SECTION 1800

1801. SANCTIONS

1801.1. Sanctions Required.

The estimate for an original work requires the following sanctions before it is taken up for execution.

- (a) Administrative sanction
- (b) Technical sanction
- (c) Financial sanction

1801.1.1. Administrative Sanction

This is the sanction accorded by the Administrative Department concerned or Government authorising the P W. D. to take up a particular work at a particular cost and in a particular location.

The Executive Engineer shall forward the preliminary estimates and related documents to the Chief Engineer with a copy to Superintending Engineer for his comments. The Superintending Engineer shall forward his comments if any within seven days of receipt failing which; it is deemed to be correct and approved by him. After the preliminary estimate and sketch plans are received, the concerned department or government will decide whether further steps shall be taken to execute the work and if so, the appropriate authority vested with power of Administrative Sanction will issue the Administrative sanction.

In some cases provisions for certain works required by other departments of the State are made in the P.W.D. budget even before formal Administrative Sanction has been accorded. The Executive Engineer in whose jurisdiction the work is located shall then take the initiative in contacting the District Officer of the concerned department for the necessary information regarding requirements, location etc. The Executive Engineer shall then prepare a preliminary estimate with sketch plan and forward to the Administrative Department if it is within his powers of technical sanction or to the Superintending Engineer if it is beyond his powers of sanction. The Superintending Engineer shall forward it to the Administrative department if it is within his powers of sanction and if it is beyond his powers he shall forward it to the Chief Engineer. The Chief Engineer shall forward the preliminary estimate to the Administrative Department for sanction.

Where the work concerned is a project beyond the power of sanction of Chief Engineer, Administrative Sanction is to be accorded on the basis of the project report and project estimate and; not on the basis of preliminary estimate and sketch plan. To enable the project estimate being prepared an investigation estimate is usually sanctioned at first and the expenditure incurred on investigation etc. charged to this estimate. When the project estimate is prepared this shall include the cost of investigation also.

If a work for which Administrative Sanction is given is not taken up within 5 years' then the sanction automatically lapses. Even during the period of currency of the Administrative Sanction viz. 5 years, if at any time detailed estimate is prepared the cost is found to exceed the amount of Administrative Sanction by more than 15% then fresh Administrative Sanction shall be obtained. This is not applicable if the excess is due to revision of schedule of rates alone.

1801.1.1 Administrative Sanction is not required in respect of the following estimates.

- a. Working Estimates.
- b. Revised estimates in cases where the excess involved is within the powers of sanction of the P. W. D. Officers.
- c. Estimates for ordinary repairs and maintenance
- d. Investigation estimates

1801.1.2 Technical Sanction.

In all cases, the competent authority in the P. W. D. on the basis of detailed project report accords technical sanction. It implies that the competent technical authority is satisfied about the suitability of the work to meet the requirement, its structural soundness and about the quantities, specifications and rates of the different items of work, which will be involved in completing the work. Before according T.S for major projects exceeding Rs. 15 crores, the Environment Cell shall review the projects to ensure compliance to environmental regulations before being accorded Technical Sanction.

The TS issuing authority shall take into consideration the views and comments recorded in the docket sheets by the intermediate officers and effect changes if required before issuing TS.

Before according Technical Sanction to a work relating to another Department, the plans shall be got countersigned by the head of the concerned department or such Officer who may be delegated with power for this purpose. In respect of minor works costing within the TS powers of Executive Engineer such countersignature is not necessary, provided the sketch plan has been approved along with the Administrative Sanction and no substantial variation has been made from the sketch plan.

Technical Sanction shall be issued only based on the Administrative Sanction for the work and the amount of Technical Sanction for any work shall not exceed the amount of Administrative Sanction by more than 15%. Before Administrative Sanction is issued availability of funds shall be ensured for execution of the work either through budget provision or through diversion from other works under the prescribed rules for such diversion or by deposit in the case of deposit works.

The following are the usual sources of funds for execution of works.

- (a) By a specific provision for the work in the Budget for the year.

-
- (b) By diversion of savings in the budget allotments for other work- subject to the rules regarding such diversion. (See paras 82-86 of the Budget Manual.)
 - (c) By obtaining a supplementary grant for the work.
 - (d) By withdrawal of the required amount from the contingency fund with the sanction of Government to be later regularised through Supplementary Grant.
 - (e) By funds being placed at the disposal of the P.W.D. for the specific work from out of budget allotments of another department.
 - (f) By obtaining deposits from the parties or authorities on whose behalf the work is to be done by the P.W.D. (Applicable to Deposit works).
 - (g) Kerala Road Fund Board
 - (h) NABARD, other agencies

The detailed project report for all original works should necessarily contain the preparatory documents such as the environmental impact assessment report and / or the environmental management plan and/ or the special environmental conditions to the contract. The environment cell should vet these and provide a note prior to according the Technical Sanction. This note should confirm the project's adherence to the environmental requirement of the code and manual.

Technical Sanction for an estimate is issued in the approved form only.

Technical Sanction powers of all officers will be revised periodically, considering the rise in prices of various commodities used.

1801.1.3. Technical Sanction Register

In every office where technical sanctions are accorded, a register in the approved form shall be maintained as under 1800 A. Each estimate sanctioned in a financial year shall be numbered consecutively and entered in the register.

Technical sanctions given to working estimates need only be noted against the sanction given for the main work originally and need not be given a separate number and noted in the register. When technical sanction is issued for a revised estimate and a fresh number is given for this estimate then the fact that the original estimates stands cancelled shall be noted against the original sanction. Correspondingly, there shall be one entry in revised sanction quoting the original estimate. When the supplementary estimate is sanctioned, the original technical sanction shall be cancelled and fresh technical sanction issued including the supplementary estimate. The respective divisional offices and the central PWD offices must also maintain the electronic form of the Register.

Original works chargeable to Central Road Fund, State Roads of economic Importance, Interstate Road, and West Coast Road are financed partly or wholly by Government of India. Estimate for original works in these cases require prior approval of the Ministry of Transport, Government of India before Technical Sanction is accorded by State P.W.D. Officers.

1801.1.4 An estimate becomes operative for execution by PWD only when funds are available. While issuing Technical Sanction, the availability of funds will be examined and the source of funds noted in the sanctions. The following are the usual sources of funds for execution of works.

- By a specific provision for the work in the Budget for the year.
 - By diversion of savings in the budget allotments for other work subject to the rules regarding such diversion.
 - By obtaining a supplementary grant for the work.
 - By withdrawal of the required amount from the contingency fund with sanction of Government and getting it regularized through Supplementary Grant.
 - By funds being placed at the disposal of the PWD for the specific work from out of budget allotments of another department.
 - By obtaining deposits from the parties or authorities on whose behalf the work is to be done by the PWD.
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1901. Registration of Contractors**Rules for Registration of contractors executing works in the Kerala PWD**

1. (a) Only persons who have registered themselves as contractor under these rules are entitled to submit tenders for works. The term 'works' includes (i) civil works and (ii) water supply and sanitary installation works. (b) Civil Works & Water Supply & Sanitary Installation Works.- A contractor who is in the register of any Circle / Division / Subdivision in the Kerala P.W.D., can tender for these works in all the Circles / Divisions / Subdivisions in the State. Temporary special Divisions or Special Subdivisions are not authorised to register contractors or renew their registration.
2. For the purpose of registration, the contractors will be classified into four separate categories on the basis of their financial resources, professional experience and records, as follows.-
 - (i) A Category.-Those who are entitled to tender for all works in any office
 - (ii) B Category. -Those who are entitled to tender for all works upto Rs. 55 lakhs in any office.
 - (iii) C Category.- Those who are entitled to tender for works upto Rs. 15 lakhs in any office.
 - (iv) D Category.-Those who are entitled to tender for works upto Rs. 6 lakhs in any office.
3. Registering Authority

Category	Registering Authority
A&B Category	Superintending Engineers of Circles
C Category	Executive Engineers of all Divisions
D Category	Assistant Executive Engineers of all Sub Division

(a) The application for registration as contractor should be supported by a solvency certificate issued by the Revenue Department or a bank guarantee by a bank approved by Government (a Nationalised or Schedule Bank) under the Bank Guarantee Scheme as follows.

Category	Rupees
A	50,000
B	25,000
C	7,500
D	No solvency certificate and Bank Guarantee

Note:-The guarantee of the banks approved by Government (Scheduled Banks) under the Bank Guarantee Scheme will be accepted.

(b) Limits for various categories of contractors for taking up work

Category	For all works	For Electrical works
A Category contractors	All works	All works
B Category Contractors	Works up to Rs. 55 lakhs	Upto Rs. 4,50,000
C Category Contractors	Upto Rs. 15 lakhs	Upto Rs. 75,000
D Category Contractors	Upto Rs. 6 lakhs	

(c) Application for registration as a contractor should be supported by details about his financial stability and also his previous experience in works. Contractors for Water Supply and Sanitary Installation works should produce the plumbing licence issued by the competent authority along with the application for registration.

4. (a) The Registering authority then scrutinise the applications for registration. He will then satisfy himself as to the financial capacity of the applicant and also his ability to take up and carry out the works in a particular category. He can, if so needed, direct the contractor to produce before him satisfactory evidence towards this. If he is satisfied that the applicant can be registered as a contractor, he will be intimated of the fact (in Form II) and will be asked to remit a registration fee at the following rates :

Category (Class)	Fees(Rs)
A	2000
B	1000
C	600
D	200

The applicant will be registered as a contractor after remittance of this fee. The registration fee is not refundable. If for any reason, the contractor is not found fit for being registered, he will be intimated so. But this must only be a bare intimation of the fact that he is not being included in the list of registered contractors.

(b) If any application for registration as a contractor is rejected, the registering authority should record in writing his reasons for denying registration. He should also intimate confidentially his reasons for denial to any application for registration to his next superior authority.

(c) No appeal will lie against this decision.

5. After registration of a person as contractor a registration card will be issued to him under the seal and signature of the registering officer in Form III. This card should be referred to in all the tenders submitted by him and be produced by the contractor, if and when called for by any officer of the P.W.D. If the original registration card is lost the authority competent to issue the original registration card may, on request made by the Contractor, after enquiring the bonafides and after obtaining an indemnity bond executed from the contractor, issue a duplicate registration card after levying a fine of Rs. 25 from the contractor along with the application for the duplicate card.
6. (a) The registration issued is valid only for two financial years. [GO(P)No.96/PW dated 23/03/1971]. Registration cards are to be renewed every two years. Application for renewal in the prescribed application form are to be submitted before 1st January together with bank guarantee solvency certificate. This may, however, be extended up to 31st January, after realising a fine of Rs. 150 for such late application [GO(P)No.84/97/PWD&T dated 19/08/1997].

Following fees shall be remitted for renewal of registration.

Category (Class)	Fees(Rs)
A	1000
B	500
C	300
D	100

(b) The registering authority can renew the registration or refuse to do so at his discretion following directions for registration as in para 4. He may refuse renewal for the following reasons:

(i) Not being satisfied of the financial stability of the applicant.

(ii) Failure to execute satisfactorily a previous contract.

(iii) Poor quality of works executed..

(iv) Failure to put up schedule of progress of works or works taken up by the applicant previously.

(v) Or any other matter which, in the opinion of the registering authority, is undesirable.

1. A contractor who fails to get his registration renewed for an year can apply afresh the next year for registration only as a new contractor.
2. The registering authority shall, before 1st March, issue the renewal card or intimate the fact of having refused the request for renewal.
3. A list of applications for registration and renewal shall be maintained by each registering authority in Form VII. The reasons for refusal should be clearly specified in the register. The register will be confidential record in the custody of the registering authority. But it will be open to inspection by his superior officer and by Audit.
4. In case a, contractor desires to be enlisted simultaneously as a registered contractor for executing non-electrical works also he may make the required deposit in the appropriate category either for electrical work or non-electrical works where the deposit is the highest.
5. Application of the Rules.-These rules will not apply for the registration of L.C.C. Societies, B.S.S. and other workers' bodies which are governed by separate Government Orders and also in respect of works which are executed under the famine relief and flood relief rules.

(b) A confidential report regarding the performance of the contractor shall be obtained from two officers of public works department not below the rank of Executive Engineer for the renewal of registration. The report should be based on the quality of work, workmanship, quality of materials used, timely completion, no. of works executed and other such factors which deserve consideration for renewal of registration. Renewal of registration should be denied for those contractors who do not have executed any work in the period during which the registration was in force.

Rules for Registration of Electrical Contractors in the Kerala P. W. D

1. For the purpose of registration, the electrical contractors will be classified into four separate categories on the basis of their financial resources, professional experience and record as follows:-
 - (i) A Category-Those who are qualified to tender for works upto any amount.
 - (ii) B Category-Those who are qualified to tender for works upto Rs. 75,000
 - (iii) C Category-Those who are qualified to tender for works upto Rs. 30,000
 - (iv) D Category-Those who are qualified to tender for works upto Rs. 5,000.
2. Enlistment of electrical contractors of all categories will be made by the Superintending Engineer of the concerned B & R Circle. Application for registration will be made in the prescribed form and should be supported by a solvency certificate by the Revenue Department or a Bank Guarantee by a bank approved by Government except in the case of electrical contractors coming under the 'D' Category. The amounts upto which such certificate or Bank Guarantee should be insisted will be as follows:
 - A Category- Rs. 50,000
 - B Category - Rs. 25,000
 - C Category - Rs.12,000
 - D Category-No solvency Certificate or Bank Guarantee.
 Note.-The guarantee of the banks approved by Government (Scheduled Banks) under the Guarantee Scheme will be accepted.
3. In the case of 'D' Category of contractors, the cost of Works for which they can tender can be fixed as the financial powers vested with the Assistant Engineers of the Electrical Wing as this category of contractor need not produce any solvency certificate. The last sub para of Rule 4 (a) (b), Rule 5, Rule 6 (a) and (b), Rule 7, 8 & 9 under Appendix 1 will apply in respect of registration as electrical contractors in the P. W. D.
4. The contractors should possess a valid contractor's licence issued by the competent authority, viz., the Licensing Board under the Chief Electrical Inspector as per the Indian Electricity Rules.
5. The Electrical contractors taking up works under A Category under these rules should have an office capable of submitting bills regularly or works done provided for in the contract. This office should have sufficient technical personnel for submitting tenders in an intelligent manner and for supervision of works.
6. The contractor desiring enlistment in the 'A' category should have executed at least 5 works individually costing more than Rs. 25,000 satisfactorily. Those who desire to enlist as contractors in the 'B' category, should have executed at least five works individually costing more than Rs. 10,000 satisfactorily and those enlisting in 'C' category at least five works individually costing more than Rs. 2,500.
7. Any contractor who desires to be enlisted simultaneously in any category in electrical works also may make the required deposit in the appropriate category either for non-electrical works or for electrical works where the deposit is highest.

Section 2000

2001. Bids (Tenders) And Arrangement Of Contracts

Works in the public works department are executed by any one of the following methods.

- i) **Departmentally:** This method is adopted in case where no contractor is available or where for other reasons, it is found more suitable
- ii) **Piece work contract:** Under this method the Piece-worker merely agrees to execute specific items of work at specific rates without reference to total quantity or time.
- iii) **By item rate contract:** In this contract the total approximate quantities of the respective items of work and the time of completion are specified and the contractual obligations cover the rate the approximate quantities involved and the time of completion. In the case of Item Rate Tenders, only quoted rate of each item shall be considered. Any tender containing percentage rates quoted shall be liable to rejection. Rates quoted shall be accurately filled-in, so that there is no discrepancy in the rates written in figures and words. However, if a discrepancy is found, the rates written in words will prevail. The item rate contract shall be followed for the works costing above Superintending Engineer's Technical Sanction Powers.

iv) Lump sum contract: Here the total cost of the completed works as per drawings and specifications and the time of completion form the essence of the contract. In adopting this contract the drawings and specifications must be full and complete in order to prevent claims arising for variations due to any ambiguity in them. Cases may, however, arise where some modifications to the designs or specifications are found necessary due to site conditions or other reasons. The bidder shall assess and evaluate & convince himself that the amount quoted by him is adequate. The department will not entertain any extra claim for such modification within the scope of the work, during execution. This method shall be adopted only in unavoidable circumstances where the situation warrants.

v) Percentage rate contract: In this type of contract the departmental rates for the different items of work in an estimate are published and the contractor quotes his rate at a percentage above, or below or at par the estimate rates so published. Only a single percentage applicable to all the items is quoted and this percentage rate is applicable to extra items, if any, are found necessary during construction. Other conditions of contract are similar to those applicable to schedule contracts.

A modification of this type of contract is when, instead of estimate rates for a work, the schedule of rates is published and the contractor is asked to quote a percentage above, below or at par, the schedule of rates so published. Since neither the total quantity of work nor the time is specified, this modified form of percentage rate contract can be applied to piecework contracts only.

The most appropriate form of contract shall be decided upon in individual cases before inviting tenders. The authority competent to accord technical sanction to the estimate is the authority, which will decide whether the work is done departmentally or through contract. In the latter case, the authority will also decide upon the form of contract. This method shall be followed for all works up to and including TS powers of Superintending Engineer.

2002. Performance Based Maintenance Contract

A Performance Based Maintenance Contract (PBMC) is a lump sum contract of all ordinary maintenance activities (Standard Jobs) in which the contractor is paid a set monthly/quarterly premium irrespective of the amount of work required to keep the road or building safe and defect-free. It becomes the contractors responsibility, without separate direction from PWD, to keep the road condition to a specified standard and period and he may incur some financial penalty if he fails to achieve this standard. Part of the contract requirement is use of specialized equipment specifically for road maintenance, and there are limited provisional works for larger repairs/resurfacings. This system shall be adopted only for major works on roads/Buildings, which satisfy minimum standards as per norms. The road or buildings to be included in this contract shall be decided by the Chief Engineer. The contract shall be valid for minimum period of three years beyond the defects liability period. If necessary an initial rehabilitation work shall be done before arranging PBMC.

2003. Bidding of works

Before bids are invited for a work there should be

- A) Administrative Sanction for the work
- B) Technical Sanction for the work
- C) 100% possession of hindrance free land.

However, in the case of road projects bids can be invited with prior permission of Govt. provided 60% of land required is available and balance can be made available during the course of construction.

The arrangement of works shall normally be made through bids (tenders) for works having administrative and technical sanctions with proportionate provisions of funds in the Budget for the year. The bidding of works shall be resorted to only after getting possession of the required land free of encumbrances.

If there is a time lag of one year between the date of preparation of the estimate and the date of tender of a work, it is necessary to verify whether any changes have occurred necessitating modification to the provisions in the estimate. If the modifications required are only minor the officer competent to enter into contract may invite tenders on the basis of the sanctioned estimate. Otherwise the estimate shall be recast and tenders invited on that basis.

2004. Tender procedure

The bids (tenders) are open to all contractors registered in PWD or recognized organizations, under State Govt. or Govt. of India irrespective of registration status and who fulfil the qualification criteria in the bid document in respect of post qualification or prequalification tenders as per provision in the bidding document. For works costing up to the TS powers of Superintending Engineer Standard Bidding Document (Minor) shall be followed. For works costing above TS powers Superintending

Engineer standard bidding document (major) for post qualification and prequalification shall be followed.

For work costing above Rs. 5 crores prequalification tender shall be followed. The criteria for the evaluation shall be prescribed in the bidding document.

For externally aided projects, norms of the concerned financing agencies shall be followed for arranging the works.

An appraisal of the contractor is an essential criteria for award of works.

2004.1 Performance Appraisal of Contractors

Such a record of appraisals over the years will serve as a useful tool while taking decision about award of works to that particular contractor and also while renewing the registration. It is suggested that a much simpler proforma may be designed for the purpose. Failures of work carried out by the contractor during the defect liability period and a quality index assigned to those works during quality audits should find a place in the proforma. Such a proforma will be filled by each EE with who the contractor is working, countersigned by the Deputy Chief Engineer concerned and submitted to the Chief Engineer. The proforma should be filled up each year and all such reports of a particular contractor may be kept in a single file to be available whenever needed. With the advent of computers it will be possible to store these in electronic form to be available to any Superintending Engineer/Chief Engineer/ other Officers at the click of the button.

2005. Time of completion

The time required for completion of a work, shall be carefully assessed based on scientific parameters and indicated in the tender schedule. The seasonal variations, cost of works, probable time required for procuring materials, the sequence of operation contemplated and such other limiting factors as having a bearing on the progress of the work shall be taken into account while fixing the time of completion. Time of completion shall be reckoned from the date of handing over of site.

2006. Advertisement of Tenders

Sl No	Work cost limits	Nature of publication	Minimum time between Publication of notice and submission of tender
1	up to TS powers of AEE's	PWD website and notice boards of the concerned Division, Sub Divisions and Sections and nearby LSGD offices, PWD Water Resources office.	7 days
2	Up to TS powers of EE's	PWD website, and in any one Malayalam newspaper having wide circulation in and nearby District.	7 days
3	Up to TS power of SE's	PWD website and in two Malayalam dailies with wide circulation in and nearby District.	7 days
4	Over SE's powers	PWD website and in one prominent English daily with wide circulation in the State and two Malayalam dailies with wide circulation.	10 days

In cases other than e-tendering the following procedures shall be followed. In addition to the above, copies of the tender notices may be forwarded to other offices in the P.W.D. Tendering authority shall **publish** the notice directly in the newspaper in case of works of urgent nature.

To reduce the advertising expense window publication for different works clubbed together shall be adopted. In such cases, detailed notices shall be published in the PWD Web site. Payment towards publication shall be made charging to work by making a provisional in the detailed estimate.

When sending window publication notice, sufficient time prescribed shall be allowed for the publication to appear in the newspaper well ahead of the last date of tender.

Normally advertisements to be published in the dailies will be arranged by the Director of Public Relations. The officer publishing tenders shall forward to the Director of Public Relations, at least 15 days before the last date proposed for publication.

In case of postponement of sale and receipt of tender, proper notice for the same should be posted in web site of Public Works Department and should be published in the same manner as that of original notice and the stipulation on time limit will apply in case of postponement also.

The tender forms shall be priced as per rates fixed by Govt. from time to time:-

Copies of bid documents shall be serially numbered 1, 2, 3, etc. and the pages and drawing of each document shall also be serially numbered. These documents shall be available in the office of the authority publishing the tender notice.

The bid documents shall be downloaded from the PWD web site. In such cases the cost of bid documents shall be remitted by demand draft along with the submission of the tender.

The bid documents shall contain the following:-

- (a) A complete set of approved architectural and structural drawings.
- (b) Complete specification of work to be done and the materials to be used or reference to item of the standard specification followed by the department or I.S.I. in respect of each item of the tender schedule.
- (c) A schedule of quantities of various items of the work.
- (d) Time fixed for completion of work or parts thereof. The time for completion of work shall be carefully assessed and fixed. This shall take into account the seasonal variations, probable time required for procuring materials, the sequence of operations contemplated, and such other limiting factors having a bearing on the progress of the work.
- (e) List of materials proposed to be issued departmentally and the recovery rates.
- (f) List of departmental tools and plant to be hired out and the hire rates.
- (g) General conditions of contract current in P. W. D. and special conditions if any applicable to the particular case.

The bid documents for a percentage rate contract will be same as listed above, except that in the schedule of quantities, the estimate rates will be noted in words and in figures and the contractor called upon to quote his percentage above, or below or at par the estimate rates. As only a single percentage is to be quoted this need not be written against individual items but must be written at the bottom of the schedule in words and in figures.

In the case of piecework contract, the tender notice may be of a simple form specifying the place of work, the facilities available, the items of work to be done and the specifications to be followed. .

If the modified percentage rate contract is to be adopted for piecework contract, the above notice shall also contain the concerned schedule of departmental rates and the contractor shall be called upon to quote his rate at a percentage above, below or at par the schedule of rates so notified.

In the case of item wise contracts the schedule shall contain only the specification for items and quantities.

2006.1 Pre-bid meeting:

There shall be a pre-bid meeting with those bidders who choose to attend as mentioned in the bid notice.

2006.1.1 Pre-bid meetings are to be held for works costing above TS Powers of Superintending Engineers. It is possible that there could be difference in the understanding of the bidders and the tendering on certain crucial issues; some errors or oversights in the tender documents could go unattended; some oversights in the tender documents could go unattended; some disputes could arise later on during execution.

2006.1.2 Date of this meeting should be declared in the tender notice and should be after the tender forms have become available to contractors. The sale of tender forms should be kept open at least for 10 days after issuance of clarifications and a corrigendum to tender documents if any, as a result of the prebid meeting.

2006.1.3 The prebid meeting should be held at the level of the Chief Engineer for large works and even at a higher level for very large works costing above Rs.20 crores. The officers who are to execute the work i.e the concerned Ex.Engr the Deputy Chief Engineer etc must attend the meeting. The contractors should be made to feel free to ask all their doubts and seek clarifications and make suggestions for betterment of the work. All their queries should be recorded in the minutes of the meeting which must invariably be drawn up and issued.

2006.1.4 If any clarification is issued on the spot, it should appear in the minutes. Certain queries may require detailed consideration and may lead to modification of the tender document or the work proposal. All such clarification should be prepared after obtaining orders from the competent authorities and meticulously issued in a tabular form. Corrigendum to tender documents should be issued to all those who have purchased the form already. The minutes of the meeting, the clarification and the corrigendum should all be attached to the tender forms issued thereafter. The contractors should be asked to initial all these when submitting their bid.

2007. Submission of bid documents**2007.1. Bid Security (Earnest Money)**

Earnest money is the financial guarantee of the bidder

- (a) to abide by the terms of the tender till decision on the tender or the expiry of the firm period whichever is earlier and
- (b) to execute the agreement to carry out the work as per conditions of the contract if his tender is accepted.

Each tender shall be accompanied by an earnest money deposit in such form and manner as prescribed in the tender notice. The rates of Earnest Money Deposit for works shall be 2.5% of the estimated probable amount of contract.

Earnest money may be produced in one or other of the following forms:

- (i.) Chalan receipt from a Government treasury, the chalan being countersigned by an authorised departmental officer where tenders are to be received.
- (ii) Draft on a scheduled Bank / Nationalised Bank made payable to the officer who invites tenders.
- (iii) Deposit at call on a schedule Bank/ Nationalised Bank Pledged in favour of the officer inviting tenders.
- (iv) National Savings Certificate or Kisan Vikas Patra
- (iv) Cash remittance is not normally accepted. The officer receiving the tenders may, if he considers necessary, relax this rule and permit cash being received in special cases.
- (v) Bank Guarantee from Nationalised Banks shall also be accepted.

Note:

- a) In the case of piece work contract the condition regarding Earnest Money Deposit shall be waived.
- b) Payment of Earnest Money Deposit is also waived in respect of organizations, which are exempted by Government to that effect.

2007.2 Bid documents:

The tender document shall include:

1. Notice Inviting Tender / Invitation for bidders (IFB)
2. Instruction to bidders
3. Conditions of Contract (General)
4. Special Conditions of Contract & Contract Data
5. General Information of The Project
6. General Technical Specifications
7. Special Technical Specifications
8. Schedule of Quantities (Tender schedule)
9. Drawings
10. Forms and Other Relevant Information (including Environmental Management Plans in case of major projects)
11. List of mandatory tests
12. Preliminary agreement

Notes: -

- (i) When special conditions are introduced by the department in bid documents for a particular work, the same shall be got approved by the next higher authority of the officer inviting tenders.
- (ii) In the case of piecework contract, the bid documents shall consist of the details regarding location, items of work or supplies for which rates are called for, rate of progress to be maintained, and form of tender together with any other special conditions found necessary.
- (iii) All documents must be self explanatory. However if any bidder seeks clarification on any matters in a tender document there is no objection for the officer accepting tenders to give clarification needed, provided this does not in any way alter or modify, what is stated in the bid documents. If in any special case such clarification, which may have the effect of modifying what is stated in the bid documents, is found necessary and unavoidable, then such clarification shall be included in the bid documents and intimated to those bidders who have already purchased tenders before the issue of such clarification.

(iv) For items not included in the data book, standard specifications shall be prepared and incorporated in BOQ.

(V) Agreement authority shall disclose the environmental issues of the Project during the pre-bid meeting

The pages and drawings of each set of bid documents shall be numbered continuously. The total number of pages of the documents and the number of drawing sheets forming part of the bid documents shall be indicated on the cover sheet. Only one copy of the tender form shall be issued to one person marked as original. However, additional copies may be sold marked as 'Duplicate' at specified prices. Duplicate copies will not be accepted in place of original tender. When a tender document is sold, the name and address of the person to whom it is sold shall be entered in the front cover page of the documents under the dated initials of the person authorised to sell the document. Bid documents sold to one party are not transferable to another.

It is necessary that the competent authorities in token of approval signs all pages, correction slips and other corrections and modifications made in the bid documents. A slip showing such corrections and modification shall be attached to the tender document before issue.

The bidder shall not make any addition, deletion or correction in any of the bid documents. If he has any reservation, the details thereof shall be sent in a separate letter along with the tender.

2008.Submission

It is important that the contractor shall examine the site condition and satisfy himself of the availability of materials at nearby places, difficulties which may arise during execution etc. before submitting the tender for the work.

1. Sealing and Marking of Tender

The bidder shall seal the tender with all relevant forms duly filled and bound and put in a separate envelope duly marking on the envelope the following

- a. Name of work with Tender No.
 - b. PAC
 - c. The concerned Circle, Division, Sub-division and section as the case may be
2. The envelope shall be addressed to the concerned officer inviting tender
 3. The tender shall be sent by registered post or speed post so as to reach the officer inviting tender before last date of receipt, sufficiently early.

2008.1. Late Bids

Any tender received by the employer after the deadline prescribed will be returned unopened to the bidder.

2008.2. Tenders by Post

All tenders for works shall be received only by Registered/Speed Post of India Post. These tenders shall be received up to the time fixed for receipt of tenders and such tenders shall be kept in safe custody of the authorized officer. Postal delays shall not be considered as mitigating factor for late submission.

2009. Opening of Tenders

The tenders shall be opened at the appointed time, in the presence of such of the bidders or their agents who may choose to be present.

If the officer who is to open the tender is on leave on tour or otherwise engaged, there shall be standing arrangement by which a senior subordinate officer is authorized to open the tender on his behalf at the appointed time and place. In case the opening date is declared a holiday the tenders shall be opened on the next working day at the same hours and place as specified in the original notification. The postponement due to declared holiday will not be applicable to submission of bids under e-tendering. The Divisional Accountant/ Financial Assistant should invariably be present at the time of opening of tenders who will also sign in the tender opening register. FA/DA should be the custodian of tenders after opening.

In case of postponement of sale and receipt of tender, proper notice for the same should be posted in the web site of Public Works Department.

On opening the tender, the tenders for works which are to be opened on that day shall be serially numbered work-wise indicating also the total number of tenders received for each work. The numbers shall be written on the facing of envelope and also on the sheet of the corresponding tender after opening eg. if 5 tenders are received the first shall be numbered 1/5, the second 2/5 as so on.

The officer opening the tender shall scrutinize the tender for any correction, omission etc. If any tender is found defective in any respect, the fact shall be noted in the tender.

In case of percentage rate tender, the officer shall read out the percentage quoted. In case of item rate tender, the total tendered amount either for the whole work or for each section and any additional conditions, which a bidder has specified along with his tender, shall be readout.

If there is difference between the rates quoted in figures and in words the rates quoted in words will alone be considered for tabulation and the officer will note in the tender in his own hand the rate to be considered for evaluation of tenders. In case more than one rate is quoted in tender, the lowest shall be considered for evaluation.

If there are mistakes in the amount for individual items or the total contract amount arrived at by a tender the correct total figure arrived at based on quantities for individual items and the rates quoted by the bidder will only be considered for evaluation of tenders.

The officer opening the tenders shall invariably record the date and initial all the corrections in each tender. He shall also put his dated initial on all pages of the tender whether they contain or do not contain corrections or over writings etc.

In case where there are corrections or overwriting on a page either in words or in figures or in both, the number of such corrections and over writings shall be indicated by separate serial numbers. The corrections/over writings shall be numbered as 1,2,3 etc. The total number of such corrections and overwriting shall be clearly mentioned at the end of each page of the tender and the sum total in the last page with the dated attestation of the officer. When there is no correction or overwriting in a page, the fact shall be noted in that page under the initials of the officer.

Any ambiguity in units or rates quoted by the bidder shall be clearly marked on the concerned page of the tender by the officer opening the tender. Where a bidder has omitted to quote the rate in figures or in words, the officer opening the tender on the concerned page of the tender at the time of opening the tender shall record the omission. When a bidder has omitted to quote rate for one or more items, the tender shall be considered incomplete and shall be rejected. After the tenders have been opened the bidders or their agent a present shall be asked to sign in the tender register in token of their having been present at the time of opening the tenders.

2009.1. Register of Tenders

All the tenders received shall be entered in a register of tenders in form given in Appendix 2000B as and when they are received and their disposal watched till the contract is settled.

2009.2. Consideration and Tabulation of tenders

The officer inviting tenders may condone minor defects if any and allow the tender to be included for tabulation. Such minor defects include:

- (a) Omission to sign or include all or any of the plans with tender.
- (b) Failure to produce the original chalan for remittance of E.M.D provided in its place the temporary receipt given from the treasury is produced and the original chalan is produced before the evaluation of tender is completed.
- (c) Omission to total the different appendices.
- (d) Failure to initial all or any of the pages provided he has signed in all the pages containing the rates and in the page in which the tender offer is made.
- (e) Failure to write rates in figures against-one or more items of the tender, provided the rates for such items are unambiguously written in words.

The discretionary power of the officer opening the tender will be utilized to protect the interest of the Government. A tabulation statement of the acceptable tender with a note on the merits of each shall be prepared by the Technical Branch of the office and scrutinized by the head of the Technical Branch. It shall also be examined by the Deputy Superintending Engineer in the case of Circle Offices, Deputy Executive Engineer in Division offices and Drawing Branch in Sub Divisions, as the case may be, before submission to the authority accepting the tender.

2009.3. Negotiation after opening of tender

There shall be no negotiation after opening of tenders.

2009.4. Approval of tender excess / quotation

Normally the lowest tender/ quotation shall be accepted. If the quoted PAC for a work calculated based on the rates quoted by the contractor is within the local market rate justification estimate, the tender / quotation shall be approved by the tendering authority. If the quoted PAC exceeds the local market rate justification estimate amount the tendering authority shall reject the tender/ quotation and retender the work or invite fresh quotation.

The tender / quotation shall be rejected in the following cases also.

- 1) Tender / quotation with additional conditions
- 2) Tender / quotation with quoted PAC less than 75% of the estimate PAC.

2009.5. Firm period

The firm period of a tender is the period from, the date of opening of the tender to the date upto, which the offer given in the tender is binding on the bidder. The firm period is fixed as the maximum time required within which a decision can be taken on the tender and order of acceptance issued in writing to the bidder which shall not exceed two months in the normal course. The consideration of tenders and decision there on shall be completed well before the date of expiry of the firm period noted in the tender so that the letter of acceptance is sent before the expiry of the firm period. If delay is anticipated, the officer who invited the tenders shall get the consent of the lowest two bidders for extending the firm period by one month or more as required. In case the lowest or any bidder refuses to extend the firm period that tender cannot be considered. All officers concerned with the consideration of tenders, shall deal with them expeditiously to settle the contract before the expiry of the firm period.

2009.6. Selection Notice

After it is decided to accept a tender, selection notice in the form of letter of acceptance as per bidding documents shall be issued to the bidder by the tendering authority within seven days or before the expiry of firm period whichever is earlier. The officer who is competent to enter into the contract shall send this notice through registered post/courier service/e-mail. The date of registration shall be the date of acceptance of the tender irrespective of the date when the communication is actually delivered to the bidder. In urgent cases, acceptance of a tender can also be communicated by telegram/ and or SMS to be followed by selection notice in proper form. In such cases, the date of filing of the telegram / sending the SMS shall be the date of acceptance of the tender. Copy of the notice shall also be sent to the subordinate officer under the control of the work. In the selection notice the selected contractor will be notified to execute an agreement within a maximum period of fourteen days from the date of acceptance of the tender. Fine at the rate of 1% of contract amount subject to a minimum amount of Rs. 1000 and a maximum amount of Rs. 25,000 shall be levied if agreement is not executed within ten days after the notified period of fourteen days.

The successful bidder shall execute the agreement within 14 days or with fine within next 10 days from the date of selection notice. In case of failure to execute the agreement within this period, tendering authority shall cancel the offer of contract forfeiting the EMD and taking such other actions as mentioned in the bidding document. After canceling, the offer of contract in the above case, the tendering authority may negotiate with the next lowest bidder and award the work to him if he expresses his willingness in writing to execute the work at the accepted rate of the default bidder. Otherwise the work will be re-tendered.

2009.7 Performance Security Deposit

The selected bidder shall produce a security deposit equal to 10% of the contract amount in the form of Bank Guarantee from any nationalized or scheduled Bank which shall remain valid till 28 days from the completion of the defect liability period.

The performance security deposit less any amount due from the contractor shall be returned to him, on written application in the form given in Appendix 2000D, after 28 days from the date of completion of the defect liability period.

If the bid of the successful bidder is unbalanced in any item in the case of item rate contract or in total in the case of percentage rate contract, relation to the estimate, the difference in cost should be deposited as performance security deposit for unbalanced price in addition to the normal performance security deposit.

2009.8 Release of Bid Security

The Bid Security (EMD) will be released to the selected bidder after he furnishes the above Performance Security deposit or Bank Guarantee and duly enters into the contract.

2010. Agreement

The agreement for the work shall be got executed by the Contractor with Department in the form prescribed in the bidding document after the award of contract within the period specified in the selection notice and duly entered into the register of agreement as per Appendix 2000E.

The agreement shall include:

- i. Original tender, plan and all accompaniments thereof.
- ii. Acceptance letter from the authority awarding the contract together with copies of correspondence, if any referred therein.

- iii. Accepted schedule with conditions of contract.
- iv. Agreement in stamp paper to the prescribed value.
- v. The MoRT&H or the relevant BIS/NBC codes shall also be considered as part of the bid documents though individual copies are not attached to such contract documents and the contractor shall comply with relevant BIS/NBC codes and MoRTH Specifications.

In the case of agreements executed in Circle offices, the agreements shall be prepared in Triplicate and all copies signed by the Contractor and the officer who executed the Agreement. The copies shall be stamped "Original" "Duplicate" and "Triplicate". The copy marked "Original" shall be in stamp paper and shall be sent for safe custody with the principal disbursing officer. The copy marked "Duplicate" will be given to the contractor and the officer who executes the agreement will retain the copy marked "Triplicate". In the case, of agreement executed in Divisions, Sub divisions and Sections the officer who executes the agreement will himself be the principal disbursing officer and therefore the custodian of such agreements. In this case the third copy of the agreements will not be necessary. Attested copies of agreements shall be forwarded to the subordinate officers responsible for preparation and scrutiny of bills. In case of contracts executed in Circle office, copies shall be sent to the Accountant General as well.

The physical custody of all original agreement executed in the Division and the Circle office will be with the Divisional Accountant of the Division. In the case of Agreements executed in Sub Divisions the physical custody of the original agreement will be with the Head Clerk and in Sections with the clerk concerned. The custodian shall keep a register of all original agreements in the form given in Appendix 2000F.

This register and the concerned original agreements shall be handed over and acknowledgement obtained in the register at the time of relinquishing of charge by the custodian officer.

Original tenders other than the accepted one shall be retained in the Technical Branch of the office of the accepting authority for a period of one year after the award of contract, and destroyed thereafter.

The accepted rates shall remain firm during the contract period. For works for which TS is issued by the Chief Engineer and having time of completion more than 18 months, the rates shall remain firm during the contract period and subject to adjustments as per price adjustment clause prescribed in the bidding document.

If a work has to be urgently carried out on account of natural calamities and other emergent reasons, such as VVIP/VIP visits and repairs to Minister's quarters the officer who is competent to arrange the work shall do so through contract agencies in accordance with the provisions in the Manual and if it is not feasible through other systems like piecemeal system, departmental execution or such other means as may be found most expedient. In such a situation, he may sent immediately communication to the Chief Engineer or the head of District Administration as the case may be by the fastest possible means and immediately thereafter seek confirmative approval of competent authority. As early as possible after arranging the work, sanction of the competent authority shall be obtained for the expenditure on the work and the manner of execution.

2011 Withdrawal of Tenders

Once the tender is submitted a bidder cannot withdraw his tender or make any modifications not acceptable to the Department. Any contravention of the above will entail forfeiture of the earnest money.

If the Department for any reason fails to issue selection notice to a bidder before the expiry of the firm period, or extended firm period mutually agreed to, his tender will stand nullified automatically unless revived by mutual consent.

Note: -A Selection notice will be valid if it is sent by registered post on or before the date of expiry of the firm period or extended firm period.

2012 Waiving of Tender Calls

In appropriate case, powers have been delegated to various officers to waive tender calls as indicated in Section 200. (Appendix) In case it has been decided to resort waiving of tender calls. It shall be done subject to the powers delegated in this regard.

2013 Quotation

The award of contract shall be made after obtaining sealed competitive quotations in case of emergency as per delegation of powers for waiving of tender calls fixing a period of three days from the date of publication of quotation notice. This type of arrangement shall also be adopted in a situation detailed under section 2013.1. The quotations need not be published in newspapers, but shall be published in the notice boards of all Section, Subdivision and Division offices in the locality. Earnest Money Deposit as per clause shall be remitted in both the above cases. However cost of quotation schedule is

exempted. For works of most urgent nature such as those relating to V.V.I.P visits, restoration for natural disasters, rectification works for road breaches and blocks failure of structures and leakage of water supply and sewage lines and works of similar nature if the competent authority feels that the above mode of arrangement would delay the rectification work, he shall obtain negotiated quotation and award the work to the lowest bidder, considering the arrangement as waiving of tender calls. In this case the officer concerned shall sanction excess in rates up to a maximum limit of estimated cost based on WPI and CPI indices rates fixed by the Executive Engineer, Buildings Division of the concerned district. While exercising this power, the concerned officer will report the details to the immediate superior officer.

When tenders have been called for a work in accordance with Section-2003 and there is no response or all the tenders received are unsatisfactory and have to be rejected, and it is considered that a call for further tenders will be futile or if the work is of an urgent nature, the officer, who is competent to accept the tender may invite sealed competitive quotations. In case it is not possible to obtain any quotations as above he shall obtain negotiated quotations and award the work to the lowest bidder. In either case, such an action to award the work to the lowest bidder shall not be considered as waiving of tender call. But should be reported to the Chief Engineer.

2013.1. Negotiated Quotation

In exceptional cases the officers of the PWD will be authorized to take up works within their powers waving of tender calls, allowing tender excess up to a maximum limit of the estimated cost based on the market rates fixed by the Executive Engineer of the concerned district. While exercising this power the concerned officer will report to the immediate superior officer.

2014 Splitting up Tenders:

Generally splitting up of works for the purpose of limiting to the expenditure to the powers delegated shall not be resorted to. However it may sometimes be more expedient to split and award a work to different contractors with a view to expeditious completion and or on grounds of economy. In such cases the officer competent to enter into contract for the whole work shall decide the manner in which the work may be split up and also whether separate tenders may be invited for the different split up portions of the work or a single tender for the whole work may be invited indicating therein the manner of splitting up proposed. In the latter case when evaluating the tenders the alternative of splitting the work among different contractors, or awarding more than one split up item to the same contractor, shall be examined, taking into consideration the speed of completion and the cost. The tender notification shall specify that the department reserves the right to split the contract in the manner given in the notice and calls for the time of completion of individual parts as well as for the whole work. Splitting shall not be resorted to if it is not provided for in the tender notice.

Splitting of works shall be resorted to only with the approval of the authority, who has accorded Administrative Sanction for the subject work.

2015. Limited Tender

Limited tender shall be adopted for works of most urgent nature relating to V.V.I.P. visits, natural calamities or other reasons, which are to be completed in the minimum time. This type of tender is necessitated also for security reasons and for maintaining secrecy. In this type of tender, the schedule shall be sold only to intending bidders included in a list of selected contractors maintained for the purpose by the Executive Engineer based on the performance certificate of the contractor, as on 1st April. The list shall be reviewed once every two years before 15th April. The provisions relating to waiving of tender called shall be applicable in this case also.

2016. E-Tendering

The process of inviting, accepting and processing tenders and communicating through the medium of Internet is termed as E-tendering. The e-tendering system facilitates complete tendering process from advertising tender notice to the placing of the contract. Measurements of works done and payment thereof are also envisaged under e-tendering. This includes the exchange of all relevant documents in electronic format. E-tendering shall have the following processes:

All the contractors shall be separately registered for E-Tendering. The officers competent to invite tenders publish the tender notices in the web site <http://www.keralapwd.gov.in> of Public Works Department. The tender notice will be published along with the documents, which are usually termed as Bid documents.

Contractors, registered for E-Tendering, shall download the tender notice and bid documents and can submit tenders online which shall remain strictly confidential. The cost of tender forms shall be paid while submitting the tender, by providing the proof of payment or by making on line payment. At the

appointed time the competent authority can open tenders online using a private key. Further processing of tenders and issuing selection notice to the successful tenderer shall be done online. Measurement and progress of works done shall also be recorded online. E-payment is envisaged under e-tendering as per which payment of works done shall be credited to the bank account of the contractor instead of issuing cheques.

2017. Vendor Development

The program for providing training to the new generation contractors who are qualified in civil engineering shall be conducted by the HRD wing of the department. The objective shall be to attract interest from new generation contractors into the construction industry.

SECTION 2100

2101. Contract Management.

2101.1. General

All officers concerned with the supervision, management and control of contract works shall thoroughly familiarize themselves with the general and special conditions of contract, the technical details and specifications of the work. The officer who has executed a contract agreement shall be responsible for the proper execution of the work as per specifications in accordance with the conditions of contract. There shall be advance planning of each item of work to keep up the progress of work specified in the agreement. For this advanced methods in planning and management techniques shall be adopted.

This planning shall be done in accordance with the schedule of work and the time frame fixed for the project, by the Assistant Engineer or Assistant Executive Engineer in respect of contracts entered into by them, or by the Executive Engineer in respect of other works. The contractor shall abide by the planning schedule of the concerned authority and direction of the field Engineers. All preliminaries such as removal of hindrances like underground cables, pipelines, electric posts, etc., shall be completed before the award of contract. Difficulties if any shall be brought to the notice of the head of departments concerned or to government. Where delay is anticipated, the matter shall be brought to the notice of the authority who executed the agreement so that the date of commencement may be fixed suitably in consultation with the contractor.

2102. Contractor's authorized agent

The contractor shall if possible, be present himself at the site of work. In case this is not possible, he shall appoint an authorised agent who shall be present at the site of work. The agent so appointed shall be responsible to act on behalf of the contractor in all matters as far as the contract is concerned except to sign agreements or to receive payments. Contractor shall engage Engineering personal as prescribed in the bidding document.

2102.1. Handing over the site

After executing the agreement the contractor or his authorised agent shall take over the site from the Assistant Engineer within ten days and commence the work immediately. If the contractor does not turn up, the acknowledgement form for handing over of site duly signed by the Assistant Engineer shall be sent to the contractor through registered post and it shall be deemed that the contractor has taken over the site from the date of posting. The contractor shall sign an acknowledgement in the form given in Appendix 2100A or his authorised agent while the site is taken over by the contractor. The Assistant Engineer shall forward copy of acknowledgement directly to the agreement authority under intimation to the other officers. For roads works in case the entire area is not available to be handed over at one stretch, the site shall be handed over in stages according to availability. In such cases, the program of construction shall be so phased as to fit in the availability of land and contractor shall **accept** the program so prepared. The officer under the control of the work shall see that the contractor complies with the conditions regarding use and care of site.

2102.2. Working Drawings

For all works except maintenance, it may be necessary to supply working drawings giving full details of the work. Such working drawings may be prepared by the site Engineers of the contractor and may be adopted with the approval of the officer who has executed the agreement. Where, however, there is substantial variation contemplated from what is provided for in the original design, modifications shall

not be approved, except with the approval of the authority who gave technical sanction to the estimate. Wherever necessary, approved working drawings may be made to form part of the contract.

2102.3. Setting out of works

Before starting any work, the work shall be set out on the ground as per approved plans. The responsibility for setting out a work is that of the contractor as per terms of contract. It is however necessary that the setting out is checked and approved by the departmental Officers. This shall be done by the Assistant Engineer for works within his T.S. Powers and the Assistant Executive Engineer in other cases. If in the course of checking, the Assistant Engineer or the Assistant Executive Engineer feels that the advice of any higher authority is necessary he shall refer the matter to such higher authority and abide by his instructions. The Agreement Authority may in the case of major works, direct that the setting out shall be got checked and approved by an officer of rank higher than that of an Assistant Executive Engineer. All benchmarks and setting out marks to be adopted for a work shall be of a permanent nature.

It is desirable to have more than one benchmark and these shall be properly interconnected to enable checking on a future date. The position of these benchmarks and setting out marks shall be shown in a sketch drawn in the field book and the work spot order book.

2102.4. Approval of Foundations

Works for which the Assistant Engineer/ Assistant Executive Engineer executes agreement, all foundations have to be approved by the concerned officer. If any advice regarding the bearing capacity or adequacy of a foundation is required then the Assistant Engineer/Assistant Executive Engineer shall refer the matter to the Executive Engineer who shall take a final decision in the matter, immediately after it is brought to his notice. For works, agreements for which are executed by an officer higher than the rank of an Assistant Executive Engineer, the Executive Engineer shall inspect and approve the foundation. If he feels that a change is required in the foundation of a work for which estimate is technically sanctioned by a higher authority, he shall refer the matter to the authority that sanctioned the estimate, which will be finally competent to order a deviation. The Assistant Engineer/Assistant Executive Engineer shall inform Executive Engineer of any change required as above through consultation or a note on the changes required which shall be submitted directly. The Executive Engineer shall take a decision himself or refer the matter to the Superintending Engineer or Chief Engineer through discussions and similar notes. In any case, a decision on the change shall be taken in the minimum time possible, so that the program for completion is not affected.

In case of well foundations of bridges, the concerned Superintending Engineer shall approve the plugging/ seating. Where a work contains several sub items, the Executive Engineer may delegate the responsibility of inspecting and approving the foundation of some minor items to the Assistant Executive Engineer concerned, provided such minor items are independent structures and will not affect the safety of the main structure concerned or the work as a whole.

2103. Quality Control

Every work has to be properly supervised to ensure that it is carried out in accordance with the required specifications. Effective supervision shall be insisted for maintaining quality of all items of work. Where there is no specification for a particular item described in the schedule, the specification of the item in the MoRTH/ NBC as the case may be, or the Indian Standard Specification shall be adopted. Every officer and subordinate controlling the construction of the work shall be fully conversant with these specifications. Any deviation from the standards prescribed shall be reported forth-with by the Assistant Engineer to the Assistant Executive Engineer. The Overseer under the control of a work shall be responsible for maintaining quality of all items of work. They are bound to act according to the duties and responsibilities laid to them as detailed in section 200. It will also be the duty of the Assistant Engineer and other inspecting officers to check the quality of works to see that the specifications are properly followed. If any bad work is noticed even though passed by a subordinate officer, it shall be ordered to be removed forth with, at the cost of the contractor. Important items like R.C.C. in works above T.S. powers of Assistant Engineer shall be carried out only in the presence of the Assistant Executive Engineer. The Assistant Executive Engineer may delegate supervision of small items of R.C.C. work like lintels, covering slab, sunshade and other similar items to Assistant Engineer, in case he is unable to be present at the time of concreting. Plain cement concrete works for levelling course, side drains and other similar items shall be done in the presence of the Overseer in charge. However, plain concrete works for major structures shall be done only in the presence of the Assistant Engineer. In all major works, the Executive Engineer shall decide, the items, which are to be done in his presence. Quality control shall be effected as per the provisions of the chapter on Quality Control. Certificates as required in this chapter shall also be insisted.

- A list of mandatory tests should be prepared and attached with the tender documents
- Test Registers should be issued to all officers under the control of the work by Executive Engineer.
- Test Reports of all mandatory tests should be submitted along with the final bill of the work.

2103.1. Sub Standard Work

If any work done is found defective or not in accordance with the specification, the Engineer under the control of the work may order its removal and re-construction or its rectification is deemed fit. The contractor is bound to carry out such removal and re-construction or rectification at his cost. The Engineer shall refer the matter to the agreement authority, who will decide whether to accept reject or rectify the same. In case it is decided to be accepted, the agreement authority will also decide the rate at which the work may be accepted.

2104. Issue, use and care of departmental materials

No departmental materials shall be issued to the contractor from the department. Bitumen required for the work shall be issued from the department for works costing up to TS powers of the Superintending Engineer.

2105. Work spot order book

For all works exceeding TS powers of Assistant Executive Engineer a work spot order book shall be maintained in the prescribed form in Appendix 2100B at the site of work. The following instructions shall be followed in maintaining work spot order book.

1. Each page of the book shall be machine numbered. The books shall be serially numbered and a register of work spot order books shall be maintained in the Section office.
2. The Overseer under the control of the supervision of the work shall be responsible for the safe custody and maintenance of the book issued to him for a particular work.
3. The Overseer at site shall record in the Work spot order book, the day-today progress of the work; procurement of materials, inspecting officers shall record their remarks and instructions in the work spot order book.

The work spot order book shall invariably be perused and initialed with date by the Assistant Engineer **in charge**, during his inspection, irrespective of whether he has any remarks to offer or not.

The work spot order book shall not be treated as a substitute for measurement book or field book.

The orders issued by the inspecting officers shall be recorded in the work spot order book. If such orders are beyond his competence, the officer issuing the orders shall address the appropriate authority and obtain ratification. The instructions and orders issued through the work spot order book will be binding on the departmental subordinates at site. The Overseer shall submit copies of the instructions to the Assistant Engineer. The Assistant Engineer shall communicate copies of instructions to be complied with by the contractor to him in writing.

2106. Progress Report

The Progress reports of works are very important for Department and Government, which enables them to monitor progress of work and to complete the work in time so as to fulfill the commitment to the public. For budgeted works, progress report in the prescribed form in Appendix 2100C1 shall be forwarded by the Assistant Engineer on or before the third day of every month and these shall be consolidated and forwarded to the Executive Engineer before 7th of every month by the Assistant Executive Engineer. The Executive Engineer shall forward **consolidated** progress report of works in his division to the Chief Engineer and Superintending Engineer before 15th of every month. The observations made by these officers after analyzing the progress report and instructions if any shall be forwarded to all the subordinate officers immediately after receipt of the progress report. However, the field officer concerned shall give maximum effort to avoid unnecessary delays in the execution of works.

The Executive Engineer shall review progress of other works monthly, the Superintending Engineer quarterly and the Chief Engineer half yearly. Conferences and their observations shall be recorded in the minutes, which shall be forwarded to all subordinate officers. The Physical and Financial progress of each work shall be analyzed in detail with the concerned field officer and bottlenecks, if any, discussed and remedial measures suggested for speedy execution of the work. The form of the progress report is as given in Appendix 2100C2

2107. Safety provisions

The Overseer under the control of a work shall ensure that all safety provisions given in Appendix 2100D applicable to the work are complied with. He shall arrange to take corrective steps wherever required. The inspecting officers shall also examine whether such provisions are adhered to.

2108. Labour

As per the provisions of the Contract Labour Regulation and Abolition Act 1970, the Executive Engineer is considered to be the principal employer of labour in respect of those employed by the contractors carrying out the work in his Division. It is therefore the duty of the Executive Engineer and his subordinate officers under the control of the works to ensure that the labour laws are properly complied with.

2109. Measurements and payments:

Payment for the works within the TS powers of the Superintending Engineer shall be based on measurements recorded at various stages of the work by the Overseer/ Assistant Engineer as the case may be and duly checked by superior officers. The contractor or his authorised agent shall be present at the time of recording of each set of measurements and shall sign the measurement book and/or level field book in token of his acceptance. If the contractor fails to be present at the time of taking measurements either in person or through his authorised agent or fails to accept the measurements or file objections to the measurements with reasons before check measurement, the measurements taken by the Engineer / Overseer shall be deemed to be correct subject to check measurements.

The measurement book in the form given in Appendix 2100E1 is the original record of actual measurements. Except for quantities of work paid on level basis, all measurements are recorded in the measurement book. Works for which the Assistant engineer has accorded TS the Overseer shall record the measurements. The measurements shall be checked by an officer higher in rank to the officer who has recorded the measurement, but not by an officer below the rank of an Assistant Engineer. If an Assistant Engineer holds full additional charge of a Sub division, the Executive Engineer shall nominate another officer under his Division, not below the rank of an Assistant Executive Engineer to check the measurements recorded by the Assistant Engineer, who holds additional charge. All measurements shall be recorded directly in the measurement book or in the field book and the description shall be lucid to enable easy identification and check. All the Measurement books and Field books belonging to each Division shall be numbered serially and pages of each book shall be machine numbered and a register of them shall be maintained in K.P.W. Form 84 in the Division Office, showing the serial number of each book, names of sections to which issued, the date of issue and date of return so that its eventual return to the Division Office may be watched. The completed measurement books shall be sent to the Division Office for final record.

The above procedure shall be adopted for the maintenance of Standard Measurement books also. A movement register shall be maintained in the Section, Sub Division and Division offices for noting the receipt and return of measurement books and LF books.

As a general rule, earth work shall be measured by level section where the total quantity exceeds 300 cum. and where the site conditions are such that level sections, will give correct indications of the quantity of work involved. If the site conditions are not suitable for working out the quantities through level sections, orders of the officer who accorded technical sanction shall be obtained for taking measurements otherwise, than by level sections in cases where the total quantity exceeds 300 cum. Where level sections are taken for computing the quantity of earth work the initial levels and final levels shall be entered in properly numbered field books (Appendix 2100E2) by the concerned Assistant Engineer. Computerized calculation methods shall be utilized for earthwork computation wherever available. The agreement authority shall approve the proposals for earthwork in the initial level sheets. The method of measurement as indicated in the standard data book in metric system shall be followed. Where there is no specific direction in this matter in the standard data book, the Indian standard method of measurement for building work shall be followed (I.S. 1200 as amended from time to time).

Electronics device shall be utilized for earthwork computation as far as possible wherever available in which case computerized print out duly signed by the contractor and verified by the Assistant Engineer checked by the Assistant Executive Engineer shall be treated as records.

If an item of work is measured in incomplete stages, up to date measurements shall be recorded each time and the quantity for payment at any stage shall be worked out by deducting the total quantity already paid from the up to date quantity measured at that time.

In making interim payments, care shall be taken to see that no over payments are made. For this purpose, if tape measurements are taken for earthwork, requiring level calculation a deduction of not less than 10 percent shall be made in the quantity assessed for payment.

In case of works, which will be covered up, measurements shall be taken prior to such covering up and got verified checked and accepted even though a bill may not be immediately due.

In case of works like demolition of an existing structure etc., which cannot be measured after execution of the work, pre measurement of the work to be done shall be taken and got check measured before the commencement of the work.

Payment for the works above the TS powers of the Superintending Engineers shall be based on measurements / reduced level recorded and signed by the contractor in computer format at various stages of the works duly verified by the Assistant Engineer and checked by the Assistant Executive Engineer. The measurement shall be in computerized M-Book format. In quadruplicate the measurements shall be verified by Assistant Engineer and checked the Assistant Executive Engineers and two copies to be returned to the contractor. One copy of this approved measurement shall be accompanied with the bills submitted by the contractor. The bill shall be prepared and submitted by the contractor in quadruplicate supported by approved measurement with soft copy. The contractor shall jointly be responsible for the correctness and completeness of the measurements with the verifying and checking officers. Computerized level field books to be issued and maintained in the same way as computerized measurement books as 5th para noted above.

The items of test check by Executive Engineer should invariably include R.C.C./Reinforcement/other high value item which will also ensure structural safety.

Interim bills may be paid at suitable intervals according to the stage of execution of the work subject to availability of funds. Assistant Engineer/Contractor shall prepare the bill on the basis of measurements taken by him and deal with it after getting the bill accepted by the contractor. After verification and check measurement, the Assistant Executive Engineer or Executive Engineer will pass the bill and effect payments as per powers delegated to them.

Payment for deposit works shall be made by the concerned officers as per powers delegated for passing and payments of bills.

2110. Payment of Work Bills

The officer competent to make payment for the work bill will be authorized to effect payment up to a maximum of 75 % of the bill amount without detailed scrutiny in his office, if the officer himself is satisfied of genuineness of the bills subject to the condition that if any excess payment is noticed, the officer who authorized the payment will be held responsible. The officer, who passes the bill, before making payment, will record a certificate to this effect in the bill (refer clause 2214 also).

2111. Deviations and Extra Items

Alterations in sanctioned designs, except of a minor nature, shall not be made in a work without the approval of the TS authority. The agreement authority shall be kept informed then and there of all deviations ordered by authorities subordinate to him. All deviations, which involve major structural alterations, whether excess cost is involved or not shall be reported to the authority who technically sanctioned the estimate and his approval obtained before effecting the deviation.

The Engineers under the control of the work shall be careful to adhere to the estimate as far as possible and shall not carry out excess quantities as a matter of course. If, however, in any item, excess over estimate quantity is inevitable and has to be carried out, the authority competent to sanction the excess amount involved shall deal with the case and concurrently report the fact to the Agreement Authority. If excess is due to additional works not contemplated in the estimate, it will not be justifiable to carry out the additional works without sanction of the authority that sanctioned the estimate. Once it is decided that excess quantity in an item shall be carried out, the contractor shall be notified in writing to that effect by the Engineer. The agreed rate for the concerned item shall be applicable for excess quantity in that item upto 25% of the agreed quantity and upto 1% of the contract price. For excess beyond this limit, and for the extra items the agreement authority shall fix the rate by negotiation with the contractor for works within their powers of T.S. and by the Chief Engineer the Government in other cases.

- Deviation from the quantities in agreement which may result in exceeding the contract value shall be taken up only after the approval of the competent authority.
- Extra/substitution of item shall be executed only after the approval of the competent authority.

2112.Extension of Time

Time shall be considered as the essence of contract except in the case of piecework contract. The contractor shall submit a chronological programme for execution of each stage of work before executing agreement which shall be examined by the agreement authority and the approved programme form part of the agreement. If it is found that contractor is not adhering to the approved programme fine shall be imposed / contract terminated as contemplated in the Standard Bidding Document. If however the failure of the contractor to complete the work on the stipulated date is due to any departmental delays or due to design and construction problems faced during execution, then he may apply for extension of time through the Assistant Engineer before the expiry of the period of completion. This shall follow the procedure of the Bidding Document. Every such application shall be properly enquired into by the Assistant Engineer /Assistant Executive Engineer under the control and a report with recommendation shall be submitted in proforma given in Appendix 2100F to the authority who executed the agreement.

The extension of time of completion that can be granted at a time shall not exceed 25% of the original time or six months whichever is less. The maximum extension that can be granted for a work shall be limited to half the original time of completion.

2112.1. Fines for Extension of Time of completion

The Contractor is bound to complete the work within the stipulated period as per the agreement. When the contract period has to be extended wholly or partly due to default on the part of the contractor, the Agreement Authority may sanction extension of time after imposing fine prescribed in the bidding document.

It is also open to the agreement authority to refuse sanction to a modified program or extension of time if such modification or extension is wholly or partly due to default on the part of the contractor. The agreement authority may in such cases cancel the contract and arrange the balance work following the procedure laid down in the General Conditions of contract / standard bidding document and rearrange the work within ninety days from the date of order of termination.

Application for extension of time from the contractor shall in all cases be made before the expiry of the time of completion as per agreement. The Assistant Engineer shall submit the application received from the contractor to Assistant Executive Engineer with his remarks / recommendations regarding the genuineness of the reasons stated by the contractor. If the contractor fails to make such application in time as mentioned above the contract will stand terminated on the expiry of the time of completion stipulated in the agreement including extension already sanctioned. In case there is no default on the part of the contractor the termination will not attract any penalty. When there is default on the part of the contractor, he shall be liable for penalties as per general conditions of contract for termination.

The contractor shall not execute any work as per the agreement after the expiry of the time of completion unless the agreement authority duly sanctions extension of time. If any work is carried out by the contractor in contravention to this, the same shall be treated as unauthorised and no payment will be made for such work. The department will also have the right to claims from the contractor, cost of dismantling and removing such unauthorised works. Departmental officers shall be responsible for the delay in completion of a project if the delay is attributed due to lapses on their part.

Fines for extension of time

Period	Rate of fine
First Extension	1% of the PAC subject to a minimum of Rs. 1000/- and maximum of Rs. 50000/-.
Beyond First Extension	2% of the PAC subject to a minimum of Rs. 2000/- and maximum of Rs. 100000/-

Incentives of timely completion

Incentive at the rate of 1% of the estimate PAC subject to the maximum of Rs. 4 lakhs will be paid to the contractor if the work is completed with the original time of completion. This clause is applicable only for works within TS powers of Chief Engineer.

2113. Date of Completion of Work

The date of completion of a work is the date of last measurements taken by the concerned Assistant Engineer/contractor on completion of work. A completion certificate in the prescribed proforma (Appendix 2100G) along with the as built drawings of the work shall be submitted to the TS authority with copies to the superior officers. Final bill will be paid only after completion is certified by the competent authority.

2114. Suspension of Works

If, in the course of execution of work, circumstances arise necessitating the suspension of the work in whole or part, the agreement authority may order suspension of the work in accordance with the provisions in the general conditions of contract. However, before ordering such suspension, the agreement authority shall consider all alternatives for different and speedy execution of the work and order suspension only if it is inevitable. The period of suspension shall be kept to the absolute minimum required.

2115. Foreclosure

Cases may arise where a work or part of it may have to be abandoned after the contract agreement for the same is executed. In such cases foreclosure shall be ordered by the agreement authority immediately after the decision is taken regarding abandonment of a part or whole of the work and further action taken in accordance with the provisions in the general conditions of contract. In such cases the contractor will not be eligible for any claim other than extension of time of completion to the extent of suspension period.

2116. Termination of Contract in Case of Death, Insanity or Insolvency:

If the contractor is an individual or a proprietary concern and the individual or the proprietor dies, becomes insane or insolvent, the agreement authority has to satisfy himself whether the legal heirs or legal representatives of the contractor are capable of carrying out and continuing the work, and if they are willing, he may entrust the balance portion of the work to such legal heir or representative on a fresh agreement on the same terms and conditions as in the original agreement. In other cases the agreement authority shall cancel the contract in respect of the incomplete portion of the work and rearrange the work otherwise without any penalty or damage to either party on account of such cancellation and rearrangement. All liabilities due to government arising under the contract up to the date of death of contractor shall be realized from the estate of the contractor.

2116.1. Termination - Default by Contractor

As per general conditions of contract, the agreement authority has the power to cancel the contract and arrange the work otherwise in the event of default by the contractor. The agreement authority in exercising the power vested with him shall follow the procedure outlined in the general conditions of the contract. The damages and penalties provided there in and applicable to the particular contract shall also be realised in accordance with the general conditions of contract.

Compensation for delay / Liquidated Damage

- 1) If the contractor fails to maintain the required progress as per conditions of contract or to complete the work and clear the site on or before the contract or extended date of completion, he shall, without prejudice to any other right or remedy available under the law to the Employer on account of such breach, pay to the employer as liquidated damages an amount calculated @ 0.1% (zero point one percent) of the contract price of the work for every week of delay subject a maximum of 10% of the contract price.
- 2) The amount of compensation may be adjusted or set-off against any sum payable to the contractor under this or any other contract with the government. In case, the contractor does not achieve a particular milestone mentioned in the conditions of contract or the re-scheduled milestone(s), the amount shown against that mile stone shall be withheld, to be adjusted against the compensation levied at the final grant of extension of time.
- 3) Withholding of this amount on failure to achieve the completion of work or of milestones shall be automatic without any notice to the contractor.

2116.2. Termination of Contract

The department can terminate the contract and rearrange the work at the risk and cost of contractor in the following cases

- i. If the contractor does not turn up for starting the work within the specified period to take charge of the site after executing the agreement.
- ii. If the contractor does not show the proportionate progress during the extended period of time of completion.
- iii. If the contractor abandons the work after executing a portion without genuine reason and does not resume or complete it even after specific direction from the Department.

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- iv. Fails to make application for extension of time of completion in time.
 - v. The licence of the contractor whose work has been terminated shall be cancelled with immediate effect and shall be barred from quoting for another work for a minimum period of five years. Contract licence shall not be renewed in his name or different name of a binamy.
 - vi. A company or person or firm once terminated shall be disqualified from participating in any tender in his name or by using a different name or binamy. There shall also be a fine and forfeiture of deposits.

2116.2.1 Realisation of loss on account of termination

An amount equal to 30% of the cost of the remaining works at agreed rates of the terminated contract shall be recovered from the defaulted contractor towards the risk and cost. The contractor shall be directed to remit the risk and cost amount within three months. There is no need to wait till the work is arranged alternatively through another contractor and the total loss sustainable due to the default of the original contractor is assessed. Such loss, if any, shall be realised after completion of the work. If he fails to remit the amount within this periods following steps can be adopted for realisation of loss. The amount can be realised from the following.

2. EMD / Security
3. Bill amount / retention if any due to the contract.
4. Any dues from department to the contract
5. Bank Guarantee / Performance Guarantee or By filling civil suit against the contractor

2116.2.2 Revoking of termination

The contract for a work on terminated by the agreement authority can be revoked by the immediate superior officer if the contractor expresses his willingness at later date to complete the balance work. But performance guarantee of 30% of the balance work to be completed shall be deposited. This performance guarantee shall be released only on completion of the work. In such case the contractor is bound to do the work at the originally agreed rates for which agreement authority shall execute a supplemental agreement with balance schedule and fresh time of completion.

2117. Rearrangement of work after termination

The procedure to minimize the loss to government on account of termination of contract shall be as incorporated in the general and special conditions of contract. Rearrangement of works should be done as expeditiously as possible and there should not be any substantial changes in the specification of balance works re-arranged.

2118. Settlement of Disputes and Differences

The agreement authority as well as the contractor shall follow the procedure contained in the relevant clause in the general conditions of the contract for settling the disputes arising out of the execution of the contract.

2119. Handing over work and site on completion

On completion of a work, the contractor shall hand over the completed work with asbuilt drawings to the Assistant Engineer concerned after removing all debris, balance materials, temporary construction etc., and cleaning up the site. The Assistant Engineer shall hand over when the work is intended for the use of any other Department or agency, the completed works along with a set of completion drawings to the concerned officer of that Department/ Agency. If any land is excess of that required by the completed work had been taken over for the work and if it is no longer required for the Department the Assistant Executive Engineer will take action to hand over such land to the Revenue Department.

SECTION 2200

2201. Execution of works

2201.1. General

All works shall be executed based on the specification of MoRTH for road works and National Building Code for building works. The Assistant Engineer is the first responsible engineering officer at the site of any construction work like buildings, bridge, roads, etc., who looks after day to day working of the project. The efforts taken & the strict supervision on his part have direct relation to the quality of work. He shall therefore get conversant with various aspects of execution of work, to discharge the duties efficiently. The Assistant Engineer can depute one or more Overseers to a work site for the effective supervision and proper quality control.

2202. Handing Over Site

The Assistant Engineer will hand over the site to the contractor as specified in section 2102.1 of contract management.

2202.1 Study of Concerned Documents by the Contractor

The basic document related to work is the estimate. Therefore it shall be thoroughly studied for its scope and provisions. The relevant valid drawings shall also be studied and understood properly. The tender document and specification of items must be clearly understood. The provision in the contract document and schedule shall be studied with reference to time limit, escalation, defect liability, progress schedule & quantities and rates mentioned. The specifications relevant to the schedule of items shall also be refreshed.

The site may be finalized and desired location of site office, storage sheds, batching plant, casting yard, labour camp etc. fixed. Source of construction material like sand, aggregates, cement and steel etc. also to be identified. Draw a detailed work programme on the basis of availability of plant, material manpower etc. for the smooth progress of work.

2202.2. Site office

The contractor shall set up site office and a permanent board shall be erected at the site displaying the details of the work including estimate cost, contract amount, period of contract, scheduled date of completion of work, name of contractor etc. The following details shall be available in the site office at all times.

1. Drawings

All drawings like plan, elevation, layout plan, sections, R.C.C. layout, alignment plan etc. shall be maintained in site office. Such plans are required for daily reference and during the inspection of higher officers. These drawings shall be properly preserved. Such drawings shall bear the signatures of officers approving such drawings, to avoid use of any other drawing. Outdated or superseded drawings shall be clearly marked as such and removed from the site. Also all drawings in CD may be kept at the office.

2. Estimate & Tender

Copy of the technically sanctioned estimate shall be kept in site office under custody of Assistant Engineer for correct reference. Similarly, the contract copy containing all documents shall be kept at site for study and guidance.

3. Other Registers

Some other registers are also required to be maintained like dewatering, record for foundation, labour attendance/ wages register maintained by the contractor.

4. Instruments to be kept at Site office

Essential instruments for execution of work shall be kept at site or carried along with if possible. The Asst. Engineer / Overseer shall take care for safe custody and proper calibration of the instruments. If there is loss/theft of any instrument, in that case the cost of instrument can be recovered from Assistant Engineer / Overseer.

These are Dumpy Level, Theodolite Vernier Caliper and Tapes. Tapes are required to be carried always for checking measurements. Generally, following tapes shall be available.

- i. Metallic tape 15 m &-30 m.
- ii. Steel tape 1m, 15 m, 30m.
- iii. Cloth tape 15m, & 30 m.

In addition each Asst. Engineer / Overseer must carry a 3 m. steel tape and a calculator in his pocket at all times. The following tools are also helpful in execution.

- hammer and peg
- chisel
- brush
- Nylon string
- 1 m straight edge + wedge
- Spirit level
- 1m meter square template
- Chalk
- Clip board
- File folder
- Torch with batteries

- Sign board
- Red & green flag (for road works)
- Umbrella/ raincoat

5. Tools and Plants

Available modern instruments, tools and plants shall be used for speed and quality work wherever possible.

2203. Safe constructional practices

Public safety as well as safety of the workforce is of utmost importance. In case of buildings the provisions of Part 7 of National Building Code 2005 shall apply. For roads and bridges refer IRC SP 55

2204. Environmental considerations

For all construction activities, provisions of environmental requirements in the code and manual shall be followed. All necessary clearances at the local, state and national levels shall be obtained prior to the start of work.

2205. Quality Assurance of works

For all construction activities the provisions of quality manual shall be followed.

2206. Clearing and Grubbing

Before any construction starts the site must be cleared of debris. All materials including trees, grass, vegetation, crops and structures, which fall within the area, must be removed. All stumps and roots need to be removed (grubbed out) and the holes/ hollows left must be filled with compacted suitable filling materials.

Existing structures that has to be demolished, shall be done as per the provision of Section 5 of Part 7, National Building Code 2005.

The products of the clearing are to be stacked in such place and in such manner as may be ordered by the Assistant Engineer and the ground shall be left in a perfectly clear condition. All products of the clearing shall be the property of Government. These shall be disposed of as per existing rules without damage to the environment.

2206.1 Layout of the Work

After having cleared the site, fix up permanent benchmarks, guide reference pillars, and transfer the alignment with the help of reference pillars fixed at site during the location survey. The layout shall be done correctly to true lines, dimensions and locations as per approved drawings. The junction pillars beyond layout area shall be erected marked, painted and maintained throughout for reference. It shall be crosschecked for right angles, diagonals etc. The Assistant Executive Engineer shall approve all layouts.

2206.2. Excavation for road work and drain and approval of foundation

All excavation shall be done as per section 300 of MoRTH specification. The Assistant Executive Engineer shall approve all excavations.

2206.3. Excavation for structures

Excavation for structures shall consist of the removal of material for the construction of foundations for buildings, bridges, culverts, retaining walls, headwalls, cut off walls, pipe culverts and other similar structures, in accordance with the requirements of these specifications and the lines and dimensions shown on the drawings or as indicated by the Assistant Engineer. The work shall include construction of the necessary cofferdams and cribs and their subsequent removal; all necessary sheeting, shoring, bracing, draining and pumping; the removal of all logs, stumps, grubs and other deleterious matter and obstructions, necessary for placing the foundations; trimming bottoms of excavations; backfilling and clearing up the site and the disposal of all surplus material.

Old curiosities, relics, coins, minerals and any other item of archeological importance found on excavation or pulling down shall be the property of the Government. Shall any ancient masonry or other old work of interest be opened up, or any religious edifice or relic be involved in removal or destruction in the execution of a work, a clear report on the matter shall be sent to Government through the Chief Engineer Administration & Designs and orders obtained before the demolition or removal of such works or relics. Regarding the disposal of old curiosities, the Assistant Executive Engineer shall consult the District Collector.

2206.4. Dewatering and protection

Normally, open foundations shall be laid dry. Where water is met with in excavation due to stream flow, seepage, springs, rain or other reasons, the Contractor shall take adequate measures to keep

the foundation trenches dry when so required and to protect the green concrete/masonry against damage by erosion or sudden rising of water level. The Contractor shall take all precautions in diverting channels and in discharging the drained water as not to cause damage to the works, crops or any other property.

2206.5. Preparation of foundation:

The bottom of the foundation shall be leveled both longitudinally and transversely or stepped as directed by the Assistant Engineer. Before footing is laid, the surface shall be slightly watered and rammed. If, during inspection, it is found that the contractor has over excavated the foundation in excess by what is shown in the drawings, he shall not be allowed to refill this with earth but, the additional excavation shall be got filled up by concrete or masonry of such proportions as decided by the Executive Engineer. No extra cost is payable to the contractor on this account.

When rock or other hard strata is encountered, it shall be freed of all soft and loose material, cleaned and cut to a firm surface either level and stepped as directed by the Assistant Engineer. All seams shall be cleaned out and filled with cement mortar or grout to the satisfaction of the Assistant Engineer.

When foundation piles are used, the excavation of each pit shall be substantially completed before beginning pile-driving operations therein.

2206.6. Public safety:

Near towns, villages and all frequented places, trenches and foundation pits shall be securely fenced and provided with proper caution signs and marked with red lights at night to avoid accidents. The Contractor shall take adequate protective measures to see that the excavation operations do not affect or damage adjoining structures. For safety precautions, guidance may be taken from IS: 3764.

2206.7. Backfilling

Backfilling shall be done with approved material after concrete or masonry is fully set and carried out in such a way as not to cause undue thrust on any part of the structure. All space between foundation masonry or concrete and the sides of excavation shall be refilled to the original surface in layers not exceeding 150 mm compacted thicknesses. The compaction shall be done with the help of suitable equipment such as mechanical tamper, rammer, plate vibrator etc., after necessary watering, so as to achieve a density not less than the field density before excavation.

2206.8. Excavated material

Excavated materials need assessing as suitable or unsuitable. Suitable materials shall be used when required for works. The excavated materials can be temporarily stockpiled, but must cause no damage to services or property. Any excess suitable material, which is not required for the construction of the works or any material classified as unsuitable is the property of Department. The contractor shall stockpile these materials separately, as directed, or place the material in an approved location on site. To be suitable as fill material the soil must not contain any vegetable matter. (Details as per MoRTH)

2206.9. Borrow Pits

The borrow pits, if any required, shall be kept as drained as possible. It shall be made only at the specified distance from the proposed structure. It shall not be cut opened where they might:-

- a) affect the stability or safety of the highway, or any railway or other structures, which may be present.
- b) prevent natural or artificial drainage or irrigation.
- c) damage adjacent property or future expansion plans for the highway.

After the correct layout is marked, cross checked and approved the excavation for foundation starts. Before starting excavation, it is necessary that ground levels are taken correctly and recorded in level book and the foundation plan. The levels at all junctions of building shall be taken at a large number of points to give correct idea of ground occupied in foundation.

Unauthorised entries to site of work shall be prohibited. The contractor shall obtain proper license for explosives whenever explosives are required to be stored at site and proper magazines as per rules must be insisted on.

2207. Formwork

The concrete acquires exact shape of the mould in which it is placed. For good concrete work, shuttering, centering and concreting operations are three important things. It is therefore important that principle of sound design, erection of the shuttering is strictly followed. Any negligence on this count may lead to mishaps resulting in loss of human life and Government money.

The provisions of clause 11 of IS 456:2000 shall be followed for formwork. The plan of the formwork proposed to be employed by contractor shall be obtained and examined by the Assistant

Executive Engineer in respect of contracts entered into by him or higher officers. In respect of contracts executed by the Assistant Engineer, the plans shall be obtained and examined by the Assistant Engineer. If such plans are not satisfactory to the Assistant Executive Engineer or the Assistant Engineer as the case may be, the contractor shall be asked to make such changes in them as may be required.

The formwork shall be robust and strong and the joints shall be leak-proof and must be properly sealed. The number of joints in the formwork shall be kept to a minimum by using large size panels.

2207.1 Forms

In designing forms, concrete shall be treated as a fluid weighing 2400 Kg. per cubic metre and in addition a live load of 700 Kg. per square metre on horizontal projection of surfaces shall also be allowed. Forms shall be so designed and constructed that they may be removed without injury to the concrete. Blocks and bracings shall be removed with the forms and in no case shall any portions of the wood forms be left in the concrete. The forms must be so constructed, set and maintained that the finished concrete shall be of the form and dimensions shown on the plans and true to line and grade. Allowance for the deflection of forms and for shrinkage and settlement of staging or centering in addition to the allowance for dead loads, and camber, as shown upon the plans shall be provided.

Forms used a second time shall be thoroughly cleaned and shall be free from bulge, splits or warps. In case of compaction of concrete by vibration, the forms shall be so designed as to withstand the effects of vibration. The formwork shall be coated with an approved release agent that will effectively prevent sticking/ coating the reinforcement and will not stain the concrete surface. Lubricating oil(machine oils) shall not be used for this purpose.

The forms shall remain in place for the period required as per clause 11.3 of IS 456 2000. The foregoing specification for forms shall also apply to steel forms. The sheets used shall be of such thickness that the forms will remain true to shape. All bolt and rivet heads shall be countersunk. Clamps, pins or other connecting devices shall be designed to hold the forms rigidly together and to allow removal without injury to the concrete. Steel forms, which do not present a smooth surface or line up properly, shall not be used. Special care shall be exercised to keep steel forms free from rust, grease or other foreign matter, which will discolour the concrete.

Broadly, the following steps shall be observed

- i) Proper design of centering system for all dead & live loads that is approved by competent officer.
- ii) Proper use of shuttering & centering material. Centering shall be of steel props & beams (telescopic), shuttering of waterproof ply board (preferably laminated on one side) & steel centering plates.
- iii) The erection shall be done carefully. The ground on which it is to be supported shall be firm and unyielding even during rains. The supports shall be adequately braced.
- iv) After erection, the Assistant Engineer and Assistant Executive Engineer shall check it for dimension, line, level & safety.
- v) The centering shall be removed only after the minimum prescribed curing period is over.

2207.2 Scaffolding

Scaffolding is the responsibility of contractors, but the departmental officer must ensure that the scaffolding provided is adequate and properly fixed together and strengthened so that workmen and others using them can carry on work safely.

2207.3 Shuttering and Centering Work

The Executive Engineer may require the contractor to use screw jacks or hardwood wedges to take up any settlement in staging or centering either before or during the placing of the concrete. All staging and false work shall be built on foundations of sufficient strength to carry the load without appreciable deformation. On stable soils, like rock, shale, stiff clay and sands free from scour, spread footings may be used and shall be of size to be determined by the load to be supported. In other locations, the formwork shall be supported on piles. The piles shall be spaced and driven to support the required loads without settlement

Special measures in the design of formwork shall be taken to ensure that it does not hinder the shrinkage of concrete. The soffit of the formwork shall be so designed as to ensure that the formwork does not restrain the shortening and/or hogging of beams during pre-stressing. Any cut outs or openings provided in any structural member to facilitate erection of formwork shall be closed with the same grade of concrete as the adjoining structure immediately after removal of formwork ensuring watertight joints. Provision shall be made for safe access on, to and about the formwork at the levels as required. Close watch shall be maintained to check for settlement of formwork during concreting. Any settlement of

formwork during concreting shall be promptly rectified. Water used for curing shall not be allowed to stagnate near the base plates supporting the staging and shall be properly drained.

2208. Materials

2208.1.Cement

Cement to be used in the works shall conform to clause 5.1 of IS 456: 2000

Bagged or bulk cement which has partially set or which contains lumps of caked cement must be rejected. The use of cement reclaimed from discarded or used bags is not permitted. Any cement stored for a long time needs to be tested before its use.

2208.2. Aggregate

It includes both fine and coarse aggregates and shall comply with the requirements of IS 383

2208.3Coarse Aggregates

Coarse aggregate shall consists of clean, hard, strong, dense, non porous crushed stones, crushed gravel , natural gravel or other approved inert materials. These shall not consist of pieces of disintegrated stones, soft, flakey, elongated particles, salt, alkali, vegetable matter or other deleterious material. Coarse aggregates having positive alkali-silica reaction shall not be used. Coarse aggregate shall confirm IS 383 and tests for conformity shall be carried out as per IS 2386 Parts I to VIII.

2208.4Fine Aggregates

It consists of natural sand or hard pieces of crushed stone or gravel or combination thereof. They shall be clean and shall not contain mica or other deleterious material in such quantities as to reduce the strength and durability of the concrete or to attack the embedded steel. It also confirm to IS 383.

2208.5.Water

Water used for mixing and curing shall be clean and free from injurious amounts of oils, acids, alkalis, salts, sugar, organic materials or other substances that may cause deterioration to concrete or steel. It shall conform to requirements of clause 5.4 of IS 456:2000. Potable water is generally considered satisfactory for mixing concrete. Mixing and curing with seawater shall not be permitted.

2208.6. Admixtures

The admixtures for concrete shall be as per clause 5.5 of IS 456:2000.

2208.7.Reinforcement

Reinforcements shall be as per clause 5.6 of IS 456:2000. The schedule & drawing of reinforcement shall be correctly prepared as per the design and got approved. The cutting length & bending schedule shall be drawn in a correct manner to be understood by the site supervisor. Some principles to be followed are

- i) The laps shall be staggered.
- ii) Extra care is needed during concreting at the crowded locations of reinforcement for good results.
- iii) Cover shall be ensured by use of proper cover blocks of concrete.
- iv) Cover shall be maintained during concreting.
- v) Reinforcement in case of projection like canopies to be maintained at its correct location (i.e. top) during concreting.
- vi) The bars placed shall be measured and recorded properly by Assistant Engineer and crosschecked by Assistant Executive Engineer before concreting.
- vii) Wherever required, the bars shall be treated for protection from corrosion, particularly in coastal areas and areas prone to industrial and environmental pollution.

2208.8. Bricks

Burnt clay bricks shall conform to the requirements of IS: 1077, except that the minimum compressive strength when tested flat shall not be less than 8.4 Mega Pascal for individual bricks and 10.5 MPa for average of 5 specimens. They shall be free from cracks and flaws and nodules of free lime. The brick shall have smooth rectangular faces with sharp comers and emit a clear ringing sound when struck. The size may be according to local practice with a tolerance of ± 5 per cent.

2208.9.Stones

Stones shall be of the type specified. It shall be hard, sound, and free from cracks, decay and weathering and shall be freshly quarried from an approved quarry. Stone with round surface shall not be used. IS 1127 shall be adopted for the dimensions of natural building stones. The crushing strength of building stones when tested as described in IS 1121 shall have a minimum value of 350 Kg/cm²

Following IS codes give specification for various stones used for construction.

Lime Stone	IS 1128
Granite	IS 3316
Marble	IS 1130
Sand Stone	IS 3622
Laterite	IS 3620

2208.9.1 Storage of Materials at site

Materials shall be stored as described in IS 4082

2208.9.2 Approval of Materials

All materials shall be got approved by the concerned Assistant Engineer or Assistant Executive Engineer as the case may be and job mix formulae / Mix design shall be got approved by the concerned Executive Engineer. For this the relevant details have to be submitted at least 20 days ahead of the planned start date.

2208.10. Supply of Materials for Road Work

Aggregate supply required for any roadwork shall be from an approved quarry/ source. The materials shall conform to the specifications in section 500 of MORTH and shall be stacked as provided in Section 514 of MoRTH.

All aggregates required for road work shall be properly stacked in stacking areas near the plant or on the road side in such a manner as not to interfere with traffic. Before the stacking is done the stacking area shall be examined to see that it is level and dimensions of the stockpiles and the Engineer shall approve their location.

Materials supplied for work during dry season shall be utilized not later than 15 days and if any contamination occurs, shall be rectified by the contractor at his own cost. Aggregates shall not be stacked until it has been thoroughly screened to gauge and free from all earth, rubbish, vegetable matter and other foreign materials. If necessary, aggregates shall be washed and allowed to drain for at least 72 hours. When ready, it shall be stacked entirely clear of the roadway either upon the berms and platforms provided for the purpose or outside the side drains where such berms do not exist. When aggregate supplies for renewal and for patchwork are both to be supplied for the same reach of a road, these shall be stacked on opposite sides.

The contract unit rates for different sizes of coarse aggregate, fine aggregate and stone filler shall be paid in full for collecting, conveying and stacking or storing at the site including full compensation for:

- (i) All royalties, fees, rents where necessary;
- (ii) All leads and lifts; and
- (iii) All labour, tools, equipment and incidentals to complete the work to the Specifications.
- (iv) All necessary testing of material, both initial, to approve the source, and regular control testing thereafter.

Aggregates shall be stacked in heaps of regular cross section. The deposition shall commence at one end of the kilometre and be carried continuously to the other end unless the Executive Engineer shall direct otherwise. Stacking shall begin at points farther from the quarry and progress continuously towards the nearer point. Suitable length in a road not more than 2 kilometer will be considered one stretch and the materials required for this stretch shall be fully supplied and stacked before measurements are taken. No road material in excess of requirements shall be stacked in that stretch. Any excess quantity shall be removed to where it is required, before the materials in that reach are measured.

If sufficient land with not available for stacking in the stretch and / or if safety consideration demands, the stacking of materials can be permitted in suitable stacking yards with prior permission from the Assistant Engineer.

All aggregates shall be measured by the Assistant Engineer and check measured by Assistant Executive Engineer before it is spread. After check measurement, each stack shall be marked by whitewash or otherwise to prevent the possibility of it being measured again. This shall be reported to the Chief Technical Examiner for verification of quantities as per section 2213. As a rule, collecting and spreading shall not be carried on at the same time in one and the same kilometre, or in two adjoining kilometers.

During the time the aggregate is supplied and stacked, there shall be frequent inspections by the Overseer as well as by Assistant Engineer to guard against stacks being formed over heaped up earth or debris.

2209. Job Mix Formula/ Mix Designs

The contractor shall submit the job mixing formula / mix design before the commencement of work. While establishing the job mix formula, the contractor shall ensure that it is based on a correct and truly representative sample of the materials that will actually be used in the work and that the mixture and its different ingredients satisfy the physical and strength requirements. Approval of the job mix formula shall be based on independent testing by the Engineer for which the contractor shall furnish samples of all ingredients of the mix as required by the Engineer. The approved job mix formula shall remain effective unless and until a revised job mix formula is approved. Shall a change in the source of materials be proposed; a new job mix formula shall be forwarded to the Executive Engineer for approval before the placing of the material.

2209.1. Plant trials - permissible variation in job mix formula:

Once the laboratory job mix formula is approved, the contractor shall carry out plant trials at the mixer to establish that the plant can be set up to produce a uniform mix conforming to the approved job mix formula. The permissible variations of the individual percentages of the various ingredients in the actual mix from the job mix formula to be used shall be within the permissible limits. These variations are intended to apply to individual specimens taken for quality control tests as given in the Chapter on Quality control.

2209.1.1 Concreting

Concrete proportioning shall be as per clause 9 of IS 456:2000. Nominal mix concrete may be used for M15 or lower. Design mix is adopted for higher grades. Concreting under special conditions shall be as per clause 14 of IS 456:2006

2209.1.2. Mixing, placing, compacting and curing of concrete

Mixing shall be as per clause 10.3 of IS 456:2000. The transport, placing, compaction and curing of concrete shall be as per clause 13 of IS 456: 2000

2209.2. General precautions

- i) The mixing proportion shall be achieved correctly by using weigh batching or volumetric method.
- ii) Concrete shall be thoroughly mixed and then immediately transported and placed without segregation and before the initial setting time. Retarding chemicals can be used for delaying the initial set, if required.
- iii) Concrete shall be well compacted, immediately on placing with vibrators. Over or under compaction shall be avoided. Care shall be taken where reinforcement is heavy in narrow sections. The finished surface shall be re trowelled after initial set to avoid surface cracks.
- iv) The curing must begin after the final set but not later than 24 Hrs. The date of concreting shall be written by paint on column/ beam faces, after removal of shuttering for easy reference. Curing shall continue for 14 days. When maintaining of proper curing is difficult, curing compounds shall be used. To conserve water, fine sprayers shall be used for curing the sides & bottoms.
- v) At least three cubes shall be taken from the working mix prescribed for day's concreting and their record shall be maintained. These cubes shall be tested in the laboratory on due dates and proper cognizance of results shall be taken. In case of abnormal results the fact shall be immediately brought to notice of the superior officers.

2209.3 Removal of Shuttering Centering:

Normally, side shuttering of column, beam faces is removed after 24 Hours. However, the centering shall be removed only after the prescribed period. While removing centering, care shall be taken to avoid injuries to the labourers or staff working there. Particular care shall be taken while removing shuttering below cantilever slab/ beams etc. Unless sufficient counter weight for the cantilever portion is developed the centering shall not be removed. If proper sequence of removal of props is not followed, the beam or truss may collapse due to wrong support pattern.

2210. Ladder

Necessary ladders must be provided in accordance with the clause 14.3 of part 7 of NBC for supervision and inspection of the official during execution and safety of the workers.

2211. Measurement of Works:**2211.1. Measurements**

Measurement shall be as per section 2109. The Assistant Engineer / Overseer / Contractor shall take measurements in time so as to get the same checked and bills passed as per terms of contract. The

contractor may also furnish measurements, in which case these shall be checked by Assistant Engineer and further checked by Assistant Executive Engineer. Any corrections shall be brought to the notice of the contractor, to be effected accordingly.

2211.2 Recording Measurement of Work

The Assistant Engineers / Overseers are given powers to record measurements of works subject to certain rules & regulations. It shall be clearly borne in mind that these powers are given only to accept sound work.

- i) Measurements shall be recorded date wise. The measurements shall be signed with name & designation. If any item is going to be covered by another item so as to be inaccessible for subsequent measurement, it shall be finally measured and measurements got checked 100 % before covering.
- ii) The measurements for works as per the specifications shall only be recorded. The recording of measurements in the Measurement Book means accepting the work. Therefore any inferior work below acceptance norms shall not be recorded.
- iii) The signature & designation with date of the checking/ cross checking officer shall be invariably got recorded, however the responsibility of getting the measurements checked lies with the officer / contractor who records the measurements.
- iv) While recording measurements for composite items, i.e. single items in the tender which includes many sub items; Viz.
 1. Composite masonry of stone & brick.
 2. Item of door, which includes frames, panels, fixtures etc.
 3. Items of w/c. containing the pan, flushing cistern, with connections, valves P/S trap or urinals stands consisting of urinal pot, connecting water supply pipe, flushing tank with overflow, disposal pipe etc.

Recording of the measurements signifies that all the sub items are completed as per the specification. However, if it is necessary to release payments for such item, then proportionate payments for work done & measured shall be recorded.

2211.3. Recording False And Incorrect Measurement or Advance Measurement - Punishment For :

The basic document for effecting payment is the Measurement Book and all payments to the contractors are governed by the measurements recorded there us & bill recorded. If false, incorrect, or excess measurements are recorded, it leads to payment not due and Govt. money is misappropriated. The punishment for such act/lapse is severe and the incumbent shall be proceeded against as per rules.

2211.4. Cross-Checking of Measurement:

The measurements of aggregate collected at road side and the steel for RCC slab work are to be got checked by Assistant Executive Engineer before spreading/concreting to ensure that complete aggregate is collected and steel bars as per design are used. This principle shall be followed thoroughly.

2211.5 Computerization of Measurements

Measurement can also be entered and kept in the centralized computer system of the department.

2212. Visit of Higher Officers for Inspection

Generally, important road, bridge & building works are inspected at higher levels by the EE, SE & CE. During such visits, the relevant information, plans, estimates, drawings etc. shall be made available for ready reference. At such times the plans are displayed properly, progress reports/bar charts are properly updated for targets/ achievements. All the quality control registers should be kept ready. Detailed Project Report, copy of the agreement etc. are to be kept handy in proper form. A short note in the form of work memo should be prepared highlighting the salient features, progress, bottlenecks, expenditure and future plans etc. The movement paths for inspection of roads, bridge & building sites are to be clearly marked, to avoid repetition and confusion in movements. These opportunities shall be utilized for seeking guidance, highlighting achievements and difficulties, highlighting shortfalls and its reasons etc. for spot decision or follow up decision. The inspecting officers shall record their comments in the work spot book and circulate the inspection note as per Appendix 2200 A to all concerned for follow up action

2213. Verification of Quantity by the Chief Technical Examiner:

Earth work in all works exceeds 1000 Cum and the quantity of any aggregate supplied for Road work exceeds 100 cum the Assistant Executive Engineer shall report by e-mail or fax to Chief Technical Examiner in the proforma given in Appendix 2200B so as to verify the reported quantity. Earth work and usage of stacked materials can be used only after the verification or on completion of three working days

from the date of sending the messages. In case of urgency the Executive Engineer shall super-check the full quantity and give sanction to proceed with the work.

In road works involving multi layer pavements powered by the level measurements initial level with proposal for subsequent layers shall be reported to the CTE without resorting to reporting of final levels of intermediate levels.

2214. Bills and Payment

Bills are normally paid at suitable intervals according to particular stages of execution of work as per the agreement for which the contractor shall submit the bill. The Assistant Engineer shall then verify the bill by taking requisite measurements.

Preparation of Bill and payment for the work shall be done only with of the following certificates:

The contractor has to produce the necessary certificates / test results for compliance to quality procedures as per chapter on quality control. Environment certificate as per the chapter on environmental aspects shall also be produced. In case of road and bridge works, Road Safety Certificate as per the chapter on road safety shall be produced (refer clause 2110 also). This shall be for works within the technical sanction powers of the Executive Engineer and above.

2215. Road Machinery

As a matter of policy modern machineries shall be used for all public works and the same should be encouraged. Mechanization of road construction is not only necessary for speedy construction but also for overall economy and for achieving the desired quality of the finished job. Starting from grubbing or site clearance, the road construction machinery can be deployed at all stages of construction till completion of the project. The requirement of appropriate machinery for excavation of different operation of road construction is given in Appendix 2200C. The expected out put of machines is given in Appendix 2200D.

2216. Departmental execution

If tenders are not obtained at reasonable rates, and there is no possibility of getting a better offer from the contractors any further, the departmental execution shall be resorted to. The field officers shall prepare the workable rate for the entire work for departmental execution and submit proposal to the concerned Chief Engineer who shall approve the proposal and issue orders fixing the ceiling cost. This shall be intimated to the government and availability of funds ensured and placed at the disposal of Assistant Engineer every month according to time schedule of the work. After completion of the work, a completion report shall be prepared. Notification inviting quotations for supply of goods and rendering services shall be advertised in one or two newspapers having circulation in the district where the work is being carried out providing a minimum gap of two weeks from the date of publication and the date of submission of quotations, where the estimate cost is above Rs. 10 Lakh. **Details of Execution of Roads, Bridges and Buildings in Appendix 2200.**

SECTION 2300

2301. DESIGN, EXECUTION & MAINTENANCE of ELECTRICAL WORKS

2301.1 General

The term "Electrical Works" is used to **denote** all works necessary for distributing electrical energy from the supplier's service within particular premises. In addition, the installation and maintenance of certain appliances operated by electricity may also be carried out as part of electrical works e.g. lifts, air conditioners, water coolers, refrigerator, heaters, cooking ranges, D.G sets, transformers, fire detection and protection systems, computer networking etc. .

The responsibility for carrying out electrical works in all Government buildings is vested with the Electrical Wing of the P.W.D. All allied electrical installations shall follow the provisions of National Building Code part 8 Section 2, amendment No.3 to National Building Code (SP7), National Electrical Code, National Illumination Code, Indian Electricity Act, Indian Electricity Rules, relevant rules of Indian Standard Specifications (ISS) and International Electro Technical Committee (IEC), amended from time to time. Even where the cost of the work involved is small, it is necessary that the estimate for electrification is prepared, technically scrutinized, and the work supervised by the technical personnel of the Electrical wing of the P.W.D.

When there is only a L.S. provision for electrification, working estimate shall be got prepared and sanctioned by competent authority and the provisions made in the estimates shall be given in consultation

with the appropriate authority of the PWD Electrical wing. If variations from the norms are found necessary, specific sanction of the Chief Engineer shall be obtained.

The number of lights, fans and other fixtures to be provided shall follow the norms specified in Part 8 of the NBC 2005 and all the standards mentioned above. If additional points, fixtures, etc., are found necessary, specific sanction of the Chief Engineer shall be obtained before provision for the same shall be included in the estimate.

In cases where the continuous functioning of life saving equipments, lights and A/C system is to be ensured even when there is failure in power supply, such as in operation theatres of hospitals, stand-by energy source shall be installed and maintained by the Electrical Wing. This alternate system shall have ample capacity to take care of the essential loads and function independently of normal power supply system (grid supply from KSEB). Government shall decide the buildings where such installations are to be provided. The capacity of the D.G set for captive power generation shall be fixed to deliver power supply considering essential loads as per requirements fixed in consultation with the Head of the concerned institutions and as per the norms specified in the above-mentioned standards.

If a building is to be used for industrial purposes and power wiring is necessary, the requirement shall be assessed on the basis of the various machinery to be installed and the wiring designed as per I.S.S. and other relevant standards.

2302.Estimate for Electrification Works

The estimates are to be prepared by the Assistant Engineer of Electrical Wing of PWD based on client requirements, but subject to prescribed norms. All estimates shall be accompanied by dimensioned plans indicating the purpose for which each room is proposed to be used and a circuit diagram and report with the following details.

- i. Location of building
- ii. Purpose of the building and nature of work conducted in the building.
- iii. Details of light points, fan points, light fittings, fan fittings and plug points etc.
- iv. Specification of working accessories and fittings.
- v. Details of major appliances, fixed and portable.
- vi. Cost of existing installation and fittings (in case of old buildings).
- vii. Details of repairs and replacements of electrical installation last effected and approximate cost (in case of old buildings)
- viii. Proximity to electric supply lines and feasibility of service connection.
- ix. The authority that will look after the maintenance of the building.

No estimate for electrification shall be technically sanctioned unless scrutinised and approved by the concerned officer of the Electrical Wing. Where lifts are to be provided, it shall be ensured that the lift well and its approaches are in conformity with the relevant Indian Standard Codes, for the type and size of lift proposed.

Sometimes it will be necessary to obtain sanction from the inspecting authorities such as Kerala State Electrical Inspectorate and the Fire Force Department for which necessary scrutiny and inspection fee will have to be paid. Provision for the same shall be included in the estimate for preparation of necessary drawings and to make necessary fees to the respective departments. The charges for the preparation of drawings and connected documents shall be included in a realistic manner so as to meet the actual expenses incurred for this purpose. The fees are to be paid by the selected contractor to the concerned department and such amounts shall be reimbursed to him / them on production of documentary evidence.

To ensure the quality of certain products as well as certain panel assemblies etc., such items will have to be tested either in any of the CPRI Test Centres or any other institutions approved by BIS to carry out such tests. In such a case, either the product or the panel assembly will have to be conveyed to the test centres and necessary testing fees will also have to be paid. It will be the responsibility of the selected contractor to convey the materials and to pay the required fees. The department shall reimburse the expenses towards one-time to and fro conveyance to the nearest Test Centre from the place of manufacture / fabrication, having the facility to conduct the prescribed test and one-time remittance of fees. If the product or the panel assembly has to be conveyed and tested further, the subsequent expenses to this effect will be on the contractors account. If tests are proposed, necessary provision shall be made in the estimate to make payments for such tests.

The estimate for electrification shall be scrutinised by the competent authority of the Electrical wing as detailed in the Delegation of powers. In the case of existing buildings under construction where electrification was not originally contemplated, the electrification estimate will require both

Administrative Sanction and Technical Sanction.

Necessary funds for making payments to avail service connection shall be included in the electrical estimate and shall be paid to the KSEB by the Executive Engineer (Electrical).

2302.1. New Buildings

In the case of new buildings to be constructed by P.W.D. adequate provision shall be made in the detailed estimate towards electrification works, subject to the requirement of the concerned department and in compliance with the standards and statutory rules mentioned above. The competent authority in Electrical Wing shall sanction necessary working estimate against any lumpsum provisions made in the estimate. The electrical works shall be done along with the civil works and completed simultaneously so as to occupy the buildings soon after construction.

2302.2. Building of other departments

In the case of existing buildings under the control of other departments on request of the District Officer of the concerned department the Assistant Executive Engineer concerned shall arrange to get the estimate for electrification work prepared and scrutinised by the competent officers of the Electrical Wing after realising the centage charges as per rules provided. It shall be ensured that funds are available for the execution of the work. In the case of deposit works, the approved estimate will be forwarded to the concerned department for Administrative Sanction and placement of necessary funds on receipt of which, necessary technical sanction for the estimate will be issued by the competent authority and the work arranged for execution.

2303. Specifications for materials and works

Detailed specification for the materials to be used and the principal items of work normally involved in electrification works shall be drawn up by the Superintending Engineer (Electrical) in the office of the Chief Engineer (Buildings). After approval by the Chief Engineer, this shall be published for adoption in the department. In preparing the specification, wherever I.S. specifications are available, the relevant I.S. specifications shall be followed. In other cases, detailed specifications shall be prepared to suit the requirements.

To facilitate easy check of the quality of materials, the Superintending Engineer (Electrical) in the Office of the Chief Engineer Building, shall also prepare a list of brands and makes of different wiring materials, fans, fluorescent lamps fittings and other equipments/control devices/gadgets which are, inconformity with the specifications and circularize the list. If different catalogue numbers/sub sections are available for the same brand, the particular catalogue number/sub section shall be mentioned. This list shall be reviewed and revised and brought up-to-date from time to time. If any material or fitting outside such accepted list is proposed to be used in any work, the Assistant Engineer (Electrical) under the control shall report the matter to the Superintending Engineer (Electrical) who will arrange for tests etc., and give instructions as to whether such materials can be used or not.

2304. Schedule of Rates

The Superintending Engineer (Electrical) in the Office of the Chief Engineer Building shall also prepare a schedule of rates for the electrification works in Government buildings periodically as ordered by Govt. The Chief Engineer (Administration & Design) shall follow the procedure lay down in section 1701 and publish this for use. Estimates for electrification shall be based on this schedule of rates and whenever any deviation is necessary, sanction of the Chief Engineer (A&D) shall be obtained.

2305. Materials fittings to be provided and stocked by the department for use in electrification works

Supply of materials and labour shall be combined and work arranged. In unavoidable circumstances some electrical materials and fittings can be procured directly by the department with the approval of the Chief Engineer (Buildings) and arrange to have the same used in electrification works.

2306. Execution of electrification works

2306.1. Contractors for Electrical works

The electrification works in Government buildings shall be arranged only through competent PWD registered electrical contractors.

2306.1.2. Invitation of Tenders

Before inviting tenders for electrification, it shall be ensured that there is a sanctioned estimate for the work and that funds are available for carrying out the work. Tenders for Electrical works shall be invited so as to complete the electrical works on the completion date of civil works. The Executive

Engineer in charge of civil works shall seek the assistance of Executive Engineer electrical to lay the conduits etc for which provision shall be included in the civil works.

2306.2. Service Connection

On completion of the electrical wiring and checking the same, the Assistant Engineer (Electrical) shall give to the Assistant Engineer (Civil)/ concerned authority, a test report and completion report for availing service connection. The Executive Engineer (Electrical) responsible for maintaining the Register of Building shall keep a copy of the circuit diagram and inventory of the buildings along with the Register. The agreement authority as per procedure shall issue a completion certificate. A copy of the completion certificates shall be issued to the concerned Assistant Executive Engineer (electrical). The Assistant Engineer (civil) under the control of the construction of the building shall arrange for the transfer of the building with the electrical installation to the occupying department. The inventory shall also be handed over to the concerned department. The authority who has control over the building and who is responsible for payment of electrical charges shall make the application for service connection.

If there is any delay on the part of the occupying department to take over the completed building together with the electrical installations, the fact shall be reported to Government so that appropriate action can be taken on the basis of Government orders.

2307. Inventory of Electrical Installations in Government Buildings.

Inventory of electrical installation in all Government buildings shall be prepared by the Assistant Engineer concerned, verified by the Assistant Executive Engineer concerned and submitted to the Executive Engineer. An inventory register of these installations shall be maintained at the Division Level. This shall contain the plan of the building, cable route, schematic diagram of the installation etc. All fittings/gadgets/equipments specifying the make, size, etc. date of completion and handing over the installation, cost and subsequent changes effected, maintenance done etc. Installations shall be tested periodically and test readings shall be recorded in the inventory register. The inventory register shall be reviewed periodically and the installation also shall be inspected.

2308. Maintenance

In an electrical installation, a defect which remains unnoticed, can cause serious and fatal accidents. It is therefore very necessary that electrical installations in Government buildings are periodically inspected and minor defects set right then and there. During such inspection, besides attending to minor repairs, if major repairs are necessary details shall be collected and the estimates prepared on the basis of such inspection.

The subordinate staff in the electrical wing shall examine the electrical installations in government buildings during service calls, attend to petty defects then and there and make a record of such inspection with a report to Assistant Engineer (Electrical). Any major repair and replacement found necessary during such service calls have to be reported to Assistant Engineer (Electrical) and further action pursued to get them done after obtaining sanction from the competent authority. The details of work attended to shall be recorded in a register maintained by the overseer and verified by the Assistant Engineer. An extract of the same shall be submitted to the Executive Engineer (Electrical) within three days after the work is done, under intimation to the Assistant Executive Engineer.

The Assistant Engineer shall periodically inspect electrical Installations in government building once in three months and by the Assistant Executive Engineer once in every six months. In respect of buildings in which the installations are in poor conditions the inspection shall be carried out more frequently. Special repairs in the nature of re-wiring and replacement of major parts, if any, during such inspection will be reported any found necessary to the Executive Engineer (Electrical) through the Assistant Executive Engineer (Electrical) accompanied by a detailed report and estimate. It shall be the duty of the officers under the control to take prompt steps to get sanction for the estimate and carry out the repair.

Normally rewiring shall not be done in buildings within a period of 15 years of the initial installation. If for any specific reason such rewiring is found necessary after conducting insulation test, the matter may be brought to the notice of the Chief Engineer and sanction obtained before rewiring is taken up. Insulation resistance and earth readings of all installations subject to periodical inspection shall be conducted at least once in a year and the reading shall be recorded in the inventory register. In case the readings are not within the permissible limits immediate action shall be taken to rectify the defects.

Funds required to meet the expenditure for the rectifications maintenance and also special repairs if any required for electrical installation, shall be made available from the allocation made for the maintenance and repairs of the buildings under the concerned Executive Engineer. The requirement shall

be assessed early in financial year and the amount required earmarked for this purpose, subject to availability of grant.

Such minor repairs and replacements necessitated during the periodical inspection and testing have to be carried out charging to respective maintenance head of account. With regard to major repairs and replacements such as rewiring, replacements of fans, fluorescent lights etc., special estimates have to be got prepared and sanction obtained from competent authority and work executed charging to relevant maintenance head. All such maintenance and special repairs estimates have to be prepared and submitted at the beginning of the financial year so as to take up the works after obtaining necessary sanction in time. In preparing the revised maintenance estimates, the cost shall not exceed the limit allowed as per Government orders or departmental circulars.

Tool kit must be available with the field staff, which they shall carry with them while they visit a centre either on routine inspection or on receipt of any notice.

The field staff shall maintain a diary of works attended and submit the same to the Assistant Engineer periodically for review.

2309. Precautions to be noted in Execution of works

- Drilling holes etc for the purpose of wiring shall not compromise the structural safety of the buildings.
- Electrification works shall be considered as complete only after rectification, plastering, and painting of walls are accomplished.
- Open wiring shall be resorted to as far as possible

2309.1. Safety Precautions

It is of utmost importance that electrical installations are maintained in good order as, even minor defects if unattended to, can cause serious accidents. All those who are connected with wiring or maintaining the electrical installations in any structure shall promptly take steps to set right the defects noticed through the appropriate technical authority after cutting power supply to the defective section of the installation.

2309.2. Accidents

In all Industrial establishments notices indicating how to treat persons who have suffered electric shock shall be displayed at prominent places as per rule 44 of the Indian Electricity Rules.

When accidents are caused due to electricity, information shall be given to the Electrical Inspector to Government as per Rule 44 A of the Indian Electricity Rules.

2309.3 Duties of Client Department

After the electrical works are completed and handed over to the user department, they shall be responsible for charges like payments of electricity charges, consumables like diesel, oil to generator, maintaining of battery etc. Petty repairs and fuse coils are to be attended by the user department. Petty repairs include changing of fuses, switches cleaning of electrical fixtures, repairs of fans and light subject to expenditure of Rs. 2000/- at a time. Improper additions will affect the installation and can be fatal to human and properties. Hence, all additions and alterations should be done through electrical wing of PWD.

SECTION 2400

2401. Quality Control

2401.1. General

Quality is an attribute to excellence. According to BSS 4778 (1) quality is totality of features and characterization of a product or service that bears on its ability to satisfy, the stated or implied needs. Quality in fact should be an ongoing process of getting the best continuously. Quality is fundamental to reliability and durability of a product. The quest for quality calls for integrity, commitment, dedication, knowledge, ethics and team work of persons involved in construction activity. Quality upgrading is a continuous process of innovations of products, processing and adapting control tools. The quality must be consistent. There are two types of quality control (1) Process control includes control at every stage specifically; and (2) End Control based on end results. Quality management covers management responsibilities, internal and external control, tests, acceptance criteria, corrective actions, documentations, transparency etc.

Two Tier Quality Monitoring System:

The PWD shall follow a two tier quality monitoring system for works. The **first tier** monitoring system shall be by the Engineers in charge of the works at various levels. The **second tier** monitoring is by Quality Control Cell at State level. The procedure for first tier quality monitoring is explained below:

All works of PWD shall be executed and tested as per the prescribed Indian Standards. Where Indian Standards are not available, these tests shall conform to the methods of test issued by the agreement authority. In addition to the officers executing the work, the officers of quality control wing of PWD shall also check quality. They shall insist on necessary tests, for ensuring the quality of work and issue certificates that shall be produced before bill payment. The work program in detail shall be intimated to the Quality control wing and any change communicated in advance.

Testing shall be done only in PWD approved labs and the expenses borne by the contractor. No claims shall be entertained in this respect. Manufactures/ Suppliers shall satisfy themselves that the materials conform to the requirement of the specifications and if requested shall supply a certificate to this effect failing which the specimen shall be tested.

If the work is found to be of inferior quality, the contractor is bound to remove / demolish the construction and replace it with prescribed quality work at his own expense. If he fails to do so, the concerned Assistant Engineer shall arrange for removal/ demolition of inferior quality work and the expenses arising due to this shall be made good from the contractor's bill.

Alternately PWD Quality Control Labs in each district and the KHRI can be utilized to do the relevant tests and issue certificates.

2402. Road Works

Quality control of road works shall be as per the guidelines provided in Section 900 of MoRTH specification for road and bridge works. Guidelines on quality systems for roads have been evolved by IRC vide SP 57 to facilitate preparation of appropriate quality systems for road projects. Procedures laid down for roads and bridges as per Quality Manuals of the department issued from time to time shall also be followed. The table 2400.1 gives the physical requirements of aggregates for bituminous base course. Table 2400.2 gives physical requirements for coarse aggregate in surface (wearing) courses and table 2400.3 the requirements of Mix for Surface (wearing) course.

For all renewal programme work mandatory tests shall be done and results incorporated with the bill. For all prequalification and post qualification works tests results from quality control wing shall be incorporated with bill. For all other works above the TS powers of Assistant Executive Engineers tests results from approved lab / field lab / district quality control lab shall be incorporated with the bill.

2402.1 Traffic Diversions and Other Disturbances include abatement of construction noise and environmental hazards, (Refer EMP for the work).

2402.2 Steps for Proper Patching of Pot-hole Given Below

- a) Preparation of area to be patched by cutting to rectangular **shape** with vertical edges
- b) Removal of all weak and loose materials and removal of dust by hand brushes and clearing **of** fine dust and excess moisture (if any) using air blower
- c) Application of tack coat using appropriate type and grade of cationic bituminous emulsion by a hand operated pressure sprayer on the entire receiving surface of the prepared area including the vertical edges (Tack coat may also applied along the vertical faces of the rectangular cut by hand brush)
- d) Laying of premix of appropriate thickness by making allowance for compaction.
- e) Thorough compaction of the mix in the patch using a small vibratory roller or any other suitable roller or compacting equipment (or even by the rear wheels of a loaded heavy truck if none of these are available), soon after laying the mix and finishing to the same level as the adjoining/surrounding area of the patch.

2403. Bridge Works

To ensure construction of safe, serviceable, durable and economically viable bridges, it is necessary to have a strategy for management of human skills by way of quality systems defining quality policy, quality assurance and quality audit. Guidelines on quality systems for road bridges have been evolved by IRC vide SP 47: 1998 to facilitate preparation of appropriate quality systems for new bridge projects. Procedures laid down for roads and bridges as per Quality Manuals of the department issued from time to time can also be followed.

For all bridge works tests certificate from the quality control wing shall be incorporated with the bill.

2404. Building Works

Quality checks shall be performed at every stage from preparation of building layout, construction, till the completion of the work.

The provisions of part 0, 2 and 3 of National Building Code and the prevailing rules and regulation of the local bodies shall be followed in preparation of architectural plans and layouts. Also the provisions contained in Section 5A (b) Part 6, Materials workmanship, inspection and testing for concrete works shall be followed. In case of masonry construction, the details as per National building code Part 6 Section 4 shall be followed. Details in Part 7, 8 and 9 of National Building Code relating construction, safety and building services shall be followed. For test on various building materials the relevant IS Codes as listed in Part V of National Building Code shall be followed.

The Executive Engineers in the Division / Assistant Executive Engineer in Sub division shall furnish copy of the contract documents to the Zonal Executive Engineers in the Quality Monitoring Cell.

For all works above the TS powers of Superintending Engineer contractor shall set up field laboratory for conducting mandatory tests.

For all original building works except prequalification work tests results from approved lab / field lab shall be incorporated in the bill. For the prequalification works certificate from the quality control wing shall be incorporated with the bill.

The second tier monitoring is the responsibility of the Quality Control Cell under the direct control of the Chief Engineer (A&D). There shall be three Executive Engineers at zonal level and a Assistant Executive Engineers at district level in the cell with lab facilities and support staff.

The Engineers in the cell shall conduct mandatory quality test for materials and works man ship at the field laboratories for major works (above the Superintending Engineer's powers of sanction) and at district level quality control labs for works below Superintending Engineer's powers. The concerned construction division shall extend the required support for carrying out the test.

The Executive Engineers at quality control cell shall forward the monitoring reports to the Chief Engineer (A&D) for major works with suggestions on the actions to correct the defects if any. The field staff should also be advised on corrective actions on the defective materials and workmanship. The Chief Engineer (A&D) shall initiate necessary actions as appropriate.

Procedures laid down for structures as per Quality Manuals of the department issued from time to time can also be followed.

2405. Physical requirement of aggregates and requirement of mix for surface wearing course refer table 2400.

2406. Technical Audit

The objective of Technical Audit on works is to encourage Departmental officers to pay adequate level of attention to quality in works. All works of original nature above Rs. 5 crores shall be subjected to Technical Audit immediately after physical completion of works through an expert agency. The Executive Engineers shall report the details along with a copy of abstract of final bill direct to the Chief Engineer (A&D) for transmitting to the agency appointed for technical audit. Further details for verification by the Technical Audit agency may be forwarded on demand. The Technical Audit agency shall conduct detailed checks at every kilometer of road or as required at site including quality of materials used, thickness of layers, workmanship etc by carrying out mandatory test as per IS, IRC standards and specifications and quality manual. National building code and other standards and specifications shall be in the case of building works. Copies of the audit details including findings shall be forwarded to the Chief Engineer (A&D) who shall promptly call for Action Taken Reports (ATR) from the Executive Engineer and Superintending Engineer on the rectification works, if any suggested by the Technical Auditor, under intimation to Govt. In case there are defects in the quality of materials, thickness in layers, or workmanship which cannot be rectified, suitable actions against the contractor and the officers responsible may be initiated under intimation to Govt. However, the technical audit shall not be linked to payment of contractor's regular and final claims as per rules.

2406.1 Selection and Performance Evaluation of Technical Auditor

The Chief Engineer (A&D) shall forward a panel of consultants with proven expertise and integrity, along with Terms of Reference (ToR), payment terms etc to Govt. once in two years for approval before 31st March. The expenses towards Technical Audit shall be charged to the contingencies of the concerned works. The Chief Engineer shall arrange to make payment through the Executive Engineer. Performance of the Technical Audit agency shall be evaluated in detail by a committee constituted by Govt. every year. The Chief Engineer (A&D) shall be the convener of the committee.

2407 Need of New Materials

With tremendous increase in traffic volume as well as in the load carried by the commercial vehicles per axle, it is necessary to introduce better materials in road works – both new construction as well as in maintenance works. Moreover, the road technology has advanced tremendously and lot of new materials and techniques are available for better performance and durability of road. There are many high performance bituminous and cementations materials available for both flexible and rigid pavement construction.

Some of the new materials and techniques are indicated in the following sections for developing suitable specifications adopting from MORTH and other agencies.

2407.1 High Performance Bituminous Materials

2407.1.1 Cationic Bituminous Emulsion

Bitumen emulsion is a liquid product in which a substantial amount of bitumen is suspended in a finely divided condition in an aqueous medium and stabilized by means of one or more suitable materials. In India, among various types, normally cationic type of emulsion is used. A small proportion of an emulsifier is also used to facilitate dispersion and to keep the globules of dispersed binder in suspension. The bitumen content in emulsions is around 60 percent and the remaining is water. When cold mix with emulsion is used on the road, it breaks down resulting in release of water and the mix starts to set. Bituminous emulsion based construction is very efficient in terms of avoiding wearing of the ingredient of the mix and preparation of the mix. However, emulsion based technology is somewhat more stringent in terms of compliance to the proportion and requirements about the cleanliness of the aggregates. The special advantage is that moist aggregates can be used for preparation of the mix. Emulsion is advantageous for both new constructions as well as for the repair and maintenance.

2407.1.2 Modified bitumen

Properties of bitumen binders and bituminous mixes can be improved to meet requirements of pavements with the incorporation of certain additives or blend of additives. These blends of additives are known as modifiers and bitumen premixed with these additives are known as Modified Bitumen. IRC:SP:53-2002 deals with “Guidelines for Use of Polymer Modified Bitumen in Road Construction”. The specification of modified bitumen by BIS has also been published recently (IS:15462-2004). The advantages of using polymer and rubber-modified bitumen are given as under.

- i. Lower susceptibility to daily and seasonal temperature variations
- ii. Higher resistance to deformation at elevated pavement temperature
- iii. Better age resistance properties
- iv. Better adhesion between aggregate and binder
- v. Higher fatigue life of mixes
- vi. Delay of cracking and reflective cracking
- vii. Overall improved performance in extreme climatic conditions and under heavy traffic conditions.

The modified bitumen are classified as:

PMB	-	Polymer Modified Bitumen (EMB or PMB)
NRMB	-	Natural Rubber Modified Bitumen
CRMB	-	Crumb Rubber Modified Bitumen

The issues related to handling of modified bitumen and mixes at sites are very important. It is extremely important that modifier is thoroughly blended with bitumen before preparation of mix so that modified bitumen retains its premium properties. The other precautions shall be as under:

- i. Preferably be blended at refinery or proper mixing plant.
- ii. Product supplied hot in tankers or if supplied in drums shall be agitated in melted conditions with suitable device.
- iii. Penetration, softening point, separation and elastic recovery test shall be conducted at site for a lot of 10 tonnes.
- iv. Multiple heating shall be avoided.
- v. In case of NRMB, material shall be supplied at 130-150^o C and shall be used within 24 hours of its filling.

2407.1.3 Modified bitumen emulsions

Modified emulsion are those whose residue is modified bitumen. Modified emulsion may be classified as mono phase and bi phase system. The types of modifying agents used for production of mono phase modified emulsions are EVA, SBS, SIS etc. In case of bi phase modified emulsions, latex of natural

or synthetic origin having extremely fine particles are used for modification in aqueous phase. The main property of this modifier is their elastic rubber behaviour of residue that allows them to accept and recover from large strains when they are exposed to temperature. This property of residue from modified emulsion can be observed by elastic recovery test. The merits of modified emulsions over normal emulsions are many but some are listed below:

- i. High cohesion at medium and high service temperature
- ii. Improved performance at low temperature
- iii. Improved rheological behaviour.
- iv. Increased plasticity interval ($P1=TR\&B-T$ Fraass)
- v. Better resistance to ageing.

2407.1.4 Multigrade Bitumen

Multigrade bitumen performs over a wide temperature range than conventional bitumen and re formulated to resist both pavement rutting/deformation at high summer temperature and pavement cracking at low winter temperature. These bitumen are mainly characterized by high value of penetration index, typically greater than 0 but less than 2. Multigrade bitumen can either be considered to bridge the performance gap between conventional bitumen and Polymer Modified Bitumen. These bitumen are in most cases applied in thick wearing courses although in special situations of very heavily trafficked roads. Multigrade bitumen can be applied in both the binder and wearing course to increase overall performance including resistance to rutting like polymer modified bitumen. Multigrade bitumen will require higher mixing and compaction temperature than those of conventional bitumen.

2407.1.5 Super-pave asphalt binder specifications

The super-paver binder specification (US-SHRP) is intended to control permanent deformation at highest pavement temperature, low temperature cracking and fatigue cracking in flexible pavements. The specification accomplishes this by controlling various physical properties. They are known as 'performance grade' meaning that the performance for the specified period is guaranteed. For example, a PG 58-16 grade is designed to be used in an environment to offer protection for an average seven day maximum temperature of -16°C . the performance grade bitumen binder is normally selected on the basis of climate from the grades. Of course, the equipments needed for performance based testing of bituminous binders are more sophisticated than the normal bitumen.

2407.1.6 Production of Cubical Aggregates

The Indian Road aggregates industry is not so very well organized as in the west. In India, hand breaking of stones is still continued in many Projects. The ideal is a hammer or a percussion crusher which by giving an impact blow would shatter the rock boulder into smaller fragments resulting in uniformly angular or cubical aggregates rather than flaky ones. Depending upon the magnitude of work involved, an integrated crushing plant should be set up for each Project. Further, introducing shaping unit after secondary crushing stage can control shape of aggregates. Crusher type also has effect on shape of aggregates is well known. The shape of aggregates gives strength to bituminous mixes. If the flakey particles are more, these are likely to be crushed under traffic and the gradation will be changed which will affect the voids in the mix and subsequently the strength properties of the mix. The reduced flakiness index, increase the mix strength and reduces the binder consumption significantly.

2407.1.7 Mastic Asphalt

Bitumen mastic, alternatively known as Mastic Asphalt, is a mixture of bitumen, mineral filler and fine aggregates in suitable proportions designed to yield a void less compact mass. Its consistency is such that it flows like a viscous fluid at temperatures of around 200°C , but on cooling to normal temperature; it solidifies into a dense mass. Thus, its construction required no compacting effort. Mastic Asphalt is used as wearing course material for heavy-duty pavement, city street carrying high volume of traffic, bus stops where heavy tangential forces are expected due to deceleration and acceleration, junctions where cornering stresses are predominant and on bridge decks. Thin mastics are also used for footpaths.

2407.1.8 Milling/Recycling of Bituminous Pavement

Cold and hot recycling of the bituminous pavement is in vogue all over the world, specially for the urban roads where increasing the levels of the road surface is often not possible. Moreover the top 1-2 cm of the bituminous surface get oxidized and become brittle to develop micro-cracks under traffic load, and bituminous materials in lower part of the bituminous layers are much better which can be reused after rejuvenating. Moreover, the most voluminous part of the road pavement, i.e the aggregates; can be reused for a fresh layer after correction of the grading by additional of required sizes. Presently, only a part of the recycled materials from bituminous layers is used in the lower layer of granular base course. However, it must be used in bituminous binder course and surfacing layer also using hot or cold recycling method approximately correcting the mix for the specifications.

2407.1.9 Stone Matrix Asphalt

Stone Mastic Asphalt (SMA) is a substitute to dense graded bituminous mix. It is a tough, stable, rut resistant mixture that relies on Stone-on-Stone contact to provide strength and a rich mortar binder to provide durability. SMA consists of two parts: a coarse aggregate skeleton with high binder and stabilizing additive. The coarse aggregate skeleton provides stone-on-stone contact, and the stabilizing additive acts to hold the asphalt binder from drain down in the mixture during the high temperatures of production and placement. SMA has proved superior performance on heavily trafficked roads in city traffic condition. The application of SMA are given below;

With high trucks frequency	On bridges
Intense wheel tracking	In bus lanes
At traffic lights	At bus-stops
At intersections	In car parks
On highways	On airport runways
On gradients	On unloading areas

2407.1.10 Porous Asphalt

Porous asphalt mix is a thin open graded mix, which has been found to **eliminate** the danger of hydroplaning, enhance surface friction, reduces spray, and night glare during wet weather conditions as porous mixes have interconnected voids and high permeability. Porous asphalt mixes are designed so as to form a surfacing with a voids ratio of about 18-22% after laying and compaction. With such a high percentage of voids, a network of channels is created in the layer, capable of carrying off the water that has fallen on the pavement during a rain/shower and penetrated the surface. The benefits from porous asphalt are:

- i. Hydroplaning potential during rainstorm is minimized
- ii. Skid resistance at high speeds during wet weather is improved
- iii. Splash and spray during wet weather is minimized
- iv. Road smoothness is improved (due to correction of minor surface irregularities)
- v. Wheel-path rutting is minimized
- vi. There are fewer glares at night during wet weather
- vii. Riding surfaces are quieter (because of less noise from tyres)
- viii. There is better wet-night visibility of traffic stripes
- ix. Safety is increased (because of reduced stress on the operator during rainstorms)

2407.2 Geosynthetics

Geosynthetic is a revolutionary material for various applications for road works to provide advantages in the performance and level of service of the specification in which it is used. These are available in various forms: geotextile, geogrid, geonet, geomembrane, geocomposite, etc for appropriate applications. Each of these are produced in different forms; for example, the geotextile can be woven or non-woven type with different gauge of the fabric to meet different strength requirements in the two perpendicular directions. Geosynthetic can be used in pavement structure for various purposes: as separation layer, drainage layer, to enhance tensile strength, to prevent reflection cracks in bituminous layers, to use in reinforced earth/fill, for consolidation of clayey layer and many other such applications.

2407.3 Cold Mix Technology

Cold mix technology aims to save heating energy in bituminous construction by use of materials in cold condition such as bitumen emulsion or cutback (only in special cases). Mix for both surfacing layer or the binder course can be prepared using cold mix method, while certain specifications for **preventive** maintenance are otherwise cold mix, e.g slurry seal and micro-surfacing. The cold mix technology has various advantages over conventional hot mix technologies.

- i. Non polluting and consumes only 70 per cent energy of the quantum consumed in 20-40 mm thick hot mix laying
- ii. Raise in pavement height is marginal say 4-6 mm
- iii. Execution is fast and safe
- iv. Surface is resistant to skidding, oxidation and stripping
- v. Cost effectiveness is also in that it saves pavement materials.

2407.4 Slurry Seal

The slurry seal is a mixture of fine aggregates, Portland cement as filler, bitumen emulsion and water. It is like a slurry of thick consistency to be laid in a layer of 1.5-5 mm thickness to seal the cracks and to fill any voids left in the surface course. Emulsion of modified bitumen provides better result. Slurry seal may be used on top of single **coat** surface dressing. The surface shall be opened to traffic in about 2 hours.

2407.5 Micro Surfacing

Micro surfacing is a high performance mixture of polymer modified emulsified bitumen, dense graded crushed mineral aggregate, filler (normally Portland Cement), Water chemical additive to facilitate early setting of mix. A typical micro surfacing mix contain 12% modified emulsion, 86% dense graded aggregate, 1% cement, 1% additive and sufficient water for workability. It is applied by synchronized machine through spreader box. The micro surfacing is a similar specification as that of slurry seal. This can be laid in thickness of 4mm to 16 mm depending on the present undulations of the surface. Structurally adequate pavements having the bituminous surface oxidized and with micro-cracks are most suited for this treatment as preventive maintenance intervention. Micro surfacing have the following advantages over convention hot mixed techniques:

- i. Marginal raise in pavement height
- ii. Least environment pollution
- iii. Life comparable to hot mix renewals
- iv. Increased skid resistance
- v. Faster laying process
- vi. High durability due to rubber additives

2407.6 Fibre Reinforced Concrete

Fibre Reinforced Concrete is a Composite material, which consists of conventional concrete reinforced by randomly, dispersed short length fibres of specific geometry, made of steel, synthetic (polymeric) or natural fibres. The secondary reinforcement (fibres) is used to uniformly improve the structural quality and also the inherent flexural strength of concrete. Internal stresses due to shrinkage are restrained by uniformly mixed fibers in the concrete. Secondary reinforcement is the approach to modify the brittle properties of concrete. The fibres are capable of carrying load across the crack.

2407.7 Roller Compacted Concrete (RCC)

RCC is a technique which makes use of zero slump concrete with or without fly ash, laying manually or with mechanical spreader and compacting with vibratory road roller of 4-6 tonnes capacity. Construction of RCC layer is fast and it is a suitable alternative technique for providing a surfacing layer for medium to low traffic roads. The grade of concrete may be M-35. The riding quality of roller compacted concrete pavement (RCCP) is not as good as cement concrete roads, but it is comparable to the bituminous roads. While the flexible pavement layers require high volume proportions of good quality aggregates (coarse and fine), this provides a very good alternative as semi-rigid base course also. Moreover, bituminous surfacing can be provided on RCC as it is done in case of DLC.

2407.8 Wet Mix Macadam (WMM)

In most of the road construction work the normal WBM technology is still in use and rarely in some special cases only WMM is considered. In view of the weakness left out in WBM construction due to non-uniformity over the surface area of the road (due to largely manual construction process), and the excessive water required to construct WBM specification, it is no longer popular for higher category of roads as well as city roads. WMM is a mix prepared from clean crushed aggregates and fine aggregates with proper grading, premixed with water, to form a dense mass, which is laid by pavers in the required thickness providing the needed camber and compacted to the finished thickness. WMM so laid is popular now a day for all types of road and is a much better specification than WBM in many ways. WMM can be laid in thickness from 75mm to 200mm in one layer depending on the compacting equipment available. WMM specifications given in clause 406 of MoRTH specification should be used directly.

2407.9 Ready Mixed Concrete

Ready mixed concrete (RMC) is a need of today's concrete construction industry to produce and deliver high quality produce economically. It is extremely useful on congested sites or in road construction where limited space is available for keeping a mixing plant as well as aggregate stock piling. It is a concrete delivered at site or into the purchaser's vehicle in plastic condition and requiring no further treatment before placing in the position in which it is to set and harden. By using RMC, there may be less chances of spillage of concrete and its constituents and the concrete mix would be of better quality than conventionally mixed concrete, since better quality control measures are adopted in making RMC is not only a "quality material" but also a "service".

2407.10 Concrete Overlay on Bituminous Pavement

2407.10.1 White Topping (WT)

A white Topping can be defined as: "A concrete overlay of adequate thickness bonded to an existing asphalt pavement". A solution for rutting asphalt pavement is 'White Topping', which means that the placement of a concrete overlay on top of asphalt pavement. This is an acceptable pavement restoration practice since 1977. Much of the white topping technology has been developed in the USA and other countries. Rigid pavement could be built in 15 to 20 cm depths over the enhanced sub grade

capacities of deteriorated asphalt pavements after correcting the existing level or providing leveling course of dry lean concrete of grade M-10 over bituminous layer.

2407.10.2 Ultra thin white topping (UTW)

With the advent of new fast track concrete pavement technologies that allow the opening of a concrete pavement within 24 hours or less of initial paving, white topping technology is advancing. Ultra Thin White Topping (UTW) is the next generation concrete pavements. It involves the construction of a concrete pavement of thickness 9 cm (90 mm) or less. Reduction in concrete pavement depths results in a substantial reduction in concrete pavement cost with large scale economy. This type of pavement is suggested where the minimum thickness of bituminous layer after milling is 75 mm and also existing bituminous layer is in good condition so that reflection cracks or sympathetic cracks are as minimum as possible. The left out cracks after milling shall be repaired first with either bituminous or cement concrete or any other suitable polymers; and thereafter, ultra thin white topping is applied. The basic purpose of UTW is to improve the riding quality along with the load carrying capacity.

2407.10.3 High Performance Concrete (HPC)

High Performance Concrete (HPC) is defined as concrete specially designed to meet long term strength and durability. Use of HPC in pavements may result in extended service life, and improvement of compressive/flexural strength and performance of the concrete. HPC is generally characterized by low water/cement ratio and may contain silica fume and fly ash as mineral admixtures as replacement of cement. The cost of the production of HPC is higher (by 16-32 percent) as compared to that of the normal concrete at equivalent mix proportion. However, there is 20 to 50 percent increase in the compressive and flexural strength as compared to conventional or normal concrete. Further, the benefits accrued from the use of HPC, such as low maintenance cost. Longer life of the structure, higher strength, trouble free service etc, shall compensate the high initial cost of the HPC. Possible benefits include:

- i. Reduced construction times
- ii. For rapid repair of distressed pavements and bridges
- iii. Chloride resistance
- iv. Reduced Permeability
- v. Reduced corrosion of steel bars
- vi. Improved durability, and serviceability, and
- vii. Enhancement of the life of concrete pavements and bridges.

2407.11 Materials for Special Applications

2407.11.1 Ready to use patching mixes/materials for repair

Carbon core asphalt is a cold mix commercially available which is a ready to use mix that can be used for resurfacing, patching and filling of potholes. It is available in disposable bags or drums. Similarly, other brands are also available like Shellmac etc, which are also capable of doing the same job. There are other polymeric cement and resin materials available commercially which can be used even in wet climate for emergency repair of roads as they set very fast.

2407.11.2 Controlled low-strength material (CLSM)

Controlled Low-Strength Material (CLSM) is defined by ACI Committee 229 as a “self-compacted material used primarily as a backfill material in lieu of compacted fill with a compressive strength of 1200 psi (8400 kPa) or less”. However, where future excavation may be required, the ultimate compressive strength of CLSM should be less than 300 psi (2100 kPa). The level of strength is very low compared to concrete, but very strong when compared to soil. CLSM is the only viable method of completely filling the voids, and additionally there is no associated cost for vibration or compaction of the material in place. Controlled low strength material (CLSM) is an useful construction material for filling the utility-cut trenches, specially for the lower layers. It is flow able grout for trench filling as it is a self-compacting grout which is pumped into the location and water is allowed to flow out.

2407.12 Quality Control for New Materials

New materials like geotextiles and modified binders or SMA and Microsurfacing or any of the other materials described in this chapter can also be used to advantage wherever appropriate. All such new materials will require appropriate quality control for the material as well as for the construction specification to derive the true advantage. Therefore, specifications and quality control requirements of each of these are to be understood clearly before their use. The quality control tests as required for use of some of these materials are given in MoRTH specification also; for example, the quality control requirements of geotextiles and modified bitumen are as given in clause 703 and 521 respectively of MORTH specifications.

Each of these new materials may be adopted for use of appropriate, but with due care for actual method of its use. Moreover, the material should be tested by more than one equipped laboratory for that purpose to prove the efficacy of the same as per available specification. If it is not used anywhere in India

under similar conditions, it must be used first for experimental purpose as test sections of the actual road for evaluation under normal traffic. For such experimentation, the manufacturer of the material should also contribute to fund the study. Such study shall comply to the following equipments.

- i. The quality control and quality assurance for such experimental (construction) sites shall be more stringent.
- ii. The proper plan for monitoring the performance of the road be made and data recorded over sufficiently long period to justify the use of such materials.
- iii. The proper record of planning and design of the experimental section is also to be maintained so as to replicate and to develop design methodology after the successful experimentation.
- iv. The manufacturer of the material should provide minimum period (normal performance) guarantee for the performance of the material under experimentation.

2407.13 Pavement Performance Evaluation

2407.13.1 Importance of Pavement Performance Evaluation

The performance of a pavement needs to be continuously evaluated with respect to both functional and structural performance. The functional evaluation needs to be carried out more frequently to know the riding quality of the pavements and the localized failures such as potholes, Raveling, cracking, rutting etc. These problems may be addressed by way of minor surface treatments. Whenever there is a need for provision of major overlays, structural evaluation needs to be carried out for designing the overlay thickness.

The deterioration in pavement riding quality due to the above mentioned failures will increase the road user costs in a significant way. By comparing the various parameters of pavement performance with their respective permissible values one can taken decisions regarding the type of maintenance measure to be implemented. Also several maintenance options for improving the pavement performance to an acceptable level could be evaluated and an economical one could be adopted.

The whole pavement performance evaluation should be a part of a Road Maintenance Management System (RMMS), where it is also possible to predict the pavement condition using deterioration models. These deterioration models could be calibrated for the local conditions by utilizing the pavement performance data. Therefore, an RMMS is essentially a preventive maintenance system which keeps the pavement performance always at an acceptable level.

Thus, the main objectives of pavement performance evaluation are

- Establish maintenance priorities
- Determine maintenance and rehabilitation strategies
- Predict pavement performance
- Evaluate the performance of new materials and techniques.

2407.13.2 Methodology of Performance Evaluation

The performance evaluation for flexible pavements in normally carried out by objectively or subjectively measuring the condition of the pavement surface with respect to roughness, surface distresses such as cracking, raveling, pothole formation, shoving, rutting, localized depressions, and skid resistance. The structural evaluation is also carried out by measuring the pavement deflection. The various techniques of objective measurement of these distresses and pavement deflection are explained below.

2407.14 Methods of Measuring Distress

The pavement performance is largely defined by evaluation in the following categories.

Roughness / Unevenness

Surface distress

Skid resistance

Structural evaluation – Deflection

Roughness / Unevenness

Pavement roughness or unevenness is generally defined as an expression of irregularities in the pavement surface that adversely affect the ride quality of a vehicle (and thus the user). Roughness is an important pavement characteristic because it affects not only ride quality but also vehicle delay costs, fuel consumption and maintenance costs.

Subjective measurement of Roughness

Pavement Roughness can be measured subjectively or objectively. In subjective measurement, a set of road users can be asked to rate the riding quality on a 0-5 scale as shown below:

Present serviceability Rating (as suggested in AASHTO on a scale of 0-5) can be worked out from these subjective ratings.

Objective Measurement of Roughness / Unevenness

In the objective measurement, the roughness is indicated in terms of cumulative measure of vertical displacements as recorded by a recorder when due to the unevenness in the longitudinal profile of the road. The cumulative measure of ups and downs in road profile is termed as roughness index or unevenness index and is represented in m/km or mm/km.

Roughness Measurement Equipment

Following are the methods/equipment that can be used for computing roughness index.

Road and level survey

A survey can provide an accurate measurement of the pavement profile. The use of surveys for large projects, however, is impractical and cost prohibitive.

Dipstick Profiler

This instrument can record the pavement profile measurement very accurately. The device records 10 to 15 readings per minute. Software analysis provides a profile accurate to 0.127 mm. However, measurements by dipstick are time consuming and therefore, it is commonly used to measure a profile for calibration of more complex instruments.

Profilographs

Profilographs have a sensing wheel, mounted to provide for free vertical movement at the center of the frame. The deviation against a reference plane, established from the profilograph frame, is recorded on graph paper from the motion of the sensing wheel. Profilographs can detect very slight surface deviations or undulations up to about 6 m in length. However, they are not practical for network condition surveys due to slow speed.

Response type road roughness meters (RTRRMs)

These instruments provide indirect measure of longitudinal road profile. The RTRRMs measure the relative movement between the body of the automobile and the centre of the rear axle. The RTRRM measurements are sensitive to the type of tyre, tyre pressure, load, vehicle suspension system, speed of vehicle, etc. Because of such sensitivity they need to be calibrated when any of the above factors change significantly. The CRRI's fifth wheel bump integrator that is normally used in India also falls in this category. The advantage of these RTRRMs is that they can record the road roughness at speeds up to 80 km/hr. Since no two RTRRMs are exactly alike, it is necessary to convert the measures (unevenness index) to a standard common international scale.

To provide a common quantitative basis on which the different measures of roughness can be compared, the International Roughness Index (IRI) was developed by World Bank. The IRI summarises the longitudinal surface profile in the wheel path and the computed from surface elevation data collected by either topographic survey or a mechanical profilometer or a dipstick. IRI is reported in units of m/km.

All the RTRRMs need to be calibrated by measuring the unevenness of a standard stretch for which IRI value are known.

Profile devices

These devices very accurately can establish the longitudinal profile of a pavement by either using contact or non-contact sensor systems. The non-contact systems use laser/ultrasonic devices for mapping the road profile. These profilometers are expensive and are normally used to calibrate RTRRMs.

Range of Roughness Values

The following figure shows the range of IRI values for different pavements and the corresponding speeds. There are several correlations between PSR and IRI. One of the correlations is presented here.

Where,

PSR = present serviceability rating

IRI = International roughness index

2407.15 Surface Distress

Surface distress is any indication of poor or unfavourable pavement performance or signs of impending failure. The general surface distresses can be grouped under the following three road groups. The distresses under each of the groups are also mentioned along with the unit of measurement in parentheses.

- Fracture – Cracking (% area cracked)
- Distortion – Localized settlements and depression (depth in mm) rutting (rut depth in mm) and shoving
- Disintegration – raveling, stripping, potholes and patching (% effected area or no of pot holes per km length)

Surface distress is related to roughness (the more cracks, distortion and disintegration – the rougher the pavement will be) as well as structural integrity (surface distress can be a sign of impending or current structural problems).

Measures of distress can be either subjective or objective. A simple example of a subjective measurement may be rating of each type of defect based on visual inspection on a scale of 0-5 as Very Poor, Poor, Fair, Good and Very Good as in PSR.

Objective measurements, which are generally more expensive to obtain, use different types of automated distress detection equipment. Older techniques, used teams of individuals who drove across every km of pavement to be measured. The measurements were made using simple instruments and by visual estimation. The rut depths were measured using straight edge and the area of cracking, patching, raveling, etc were visually estimated. Based on the objective measurements the present serviceability index (PSI) could be obtained using the ASSHTO equation.

Current methods record pavement surface distresses using video imaging using a specially equipped van that is fitted with high resolution cameras. The van can travel at the usual highway speeds. Evaluation is either done manually by playing the video back on specially designed work stations while trained crews rate the recorded road surface or automatically by computer image processing software's. In more advanced Integrated Pavement Analysis Units, in addition to high resolution video cameras, other instruments such as non-contact (laser) profilometers for mapping longitudinal as well as transverse pavement profile, distance measuring instrument and computer workstations for processing the data are fitted. Automatic Road Analyzer and Laser Road Surface Tester fall in this category.

Using integrated pavement analysis units one can obtain the following measurements.

- Roughness
- Distress (cracking, rut depth)
- Gradients, camber, curvature
- Pavement texture

The rating suggested by IRC in its guidelines or maintenance management of primary, a secondary and urban road is given in the following table:

Pavement condition rating based on Different Types of Defects

Defects		Range of Distress			
Cracking (%)	>30	21 to 30	11 to 20	5 to 10	<5
Ravelling (%)	>30	11 to 30	6 to 10	1 to 5	0
Pothole (%)	>1	0.6 to 1.0	0.1 to 0.5	0.10	0
Shoving (%)	>1	0.6 to 1.0	0.1 to 0.5	0.10	0
Patch (%)	>30	16 to 30	6 to 15	2 to 5	<2
Settlement and depression (%)	>5	3 to 5	Up to 2	Up to 1	0
Rutting (mm)	>50	21 to 50	11 to 20	5 to 10	<5
Rating	1	2	3	4	5
Condition	Very Poor	Poor	Fair	Good	Very Good

(Source: Guidelines for Maintenance Management of Primary, Secondary and Urban Roads, IRC, 2004)

2407.16 Skid Resistance

Skid resistance is the force developed when a tyre that is prevented from rotating slides along the pavement surface (Highway Research Board, 1972). Skid resistance is an important pavement evaluation parameter because inadequate skid resistance will lead to higher incidences of skid related accidents. Skid resistance depends on pavement surface texture. Skid resistance changes over time.

Typically it increases in the first two years following construction as the roadway is worn away by traffic and rough aggregate surfaces become exposed, and then decreases over the remaining pavement life as aggregates become more polished.

Skid resistance is generally quantified using some form of friction measurement such as a friction factor or skid number.

Friction factor (like a coefficient of friction) : = F/L

Skid number: SN = 100 (f)

Where:

F = Frictional resistance to motion in plane of interface

L = Load perpendicular to interface

Measurement Techniques

- Portable pendulum skid tester
- The locked wheel tester
- The spin up tester
- Pavement surface texture measurement

Portable Pendulum Skid Tester

It is a dynamic pendulum impact type tester for measuring the resistance offered by a surface under test. It is used for measuring spot value of surface friction at representative locations. Though, it provides good information on the skid resistance of the pavement, it cannot provide data with different speeds.

The locked wheel tester

This method uses a locked wheel skidding along the tested surface to measure friction resistance. It is possible to measure skid resistance at different speeds in this method.

The spin up tester

A spin up tester has the same basic setup as a locked wheel tester but operates in an opposite manner. For a spin up tester, the vehicle (or trailer) is brought to the desired testing speed (typically 64 km/hr) and a locked test wheel is lowered to the pavement surface. The test wheel braking system is then released and the test wheel is allowed to “spin up” to normal travelling speed due to its contact with the pavement. The friction force can be computed by knowing the test wheel’s moment of inertia and its rotational acceleration. This avoids the use of costly force measuring equipment.

Pavement surface texture measurement

In this method the pavement skid resistance is correlated with the pavement macro texture. By measuring the pavement texture and using the established correlation between the macro texture and the skid resistance, the skid resistance is obtained.

Deflection

Pavement surface deflection measurements are the primary means of evaluating a flexible pavement structure. Although other measurements can be made that reflect (to some degree) a pavements structural condition, surface deflection is an important pavement evaluation method because the magnitude and shape of pavement deflection is a function of traffic (type and volume), pavement structural section, temperature affecting the pavement structure and moisture affecting the pavement structure. Deflection measurements can be used in back calculation methods to determine pavement structural layer stiffness and the sub grade resilient modulus. Furthermore, pavement deflection measurements are non-destructive destructive in nature which adds on to the overall viability of usage.

Measurement Technique

The pavement surface deflections can be measured using either static deflection equipment or impact load deflection devices. Static deflection equipment measure pavement deflection in response to a static load. Benkelman Beam falls in this category. Impact load devices deliver a transient impulse load to the pavement surface. The subsequent pavement response (deflection basin) is measured by a series of sensors. The most common type of equipment is the falling weight deflectometer (FWD)

Benkelman Beam

Is a simple device that operates on the lever arm principle. The Benkelman Beam is used with a loaded truck – typically 80 kN on a single axle with dual tires inflated to 480 to 550 kPa. Placing the tip of the beam between the dual tires and measuring the pavement surface rebound as the truck is moved away to make measurement. The Benkelman Beam is low cost but is also slow, labor intensive and does not provide a deflection basin. The procedure of measuring rebound deflection and finding the characteristic deflection using Benkelman Beam is documented in the following standard.

IRC: 81-1997 Guidelines for strengthening of flexible road pavements using Benkelman Beam deflection technique.

Using the above standard one can design the overlays after arriving at the pavement characteristic rebound deflection.

Falling Weight Deflectometer

(FWD) is an impact load device that delivers a transient impulse load to the pavement surface and the resulting pavement response (deflection basin) is measured by a series of sensors (geophones). Vertical deflection of the pavement in multiple locations is recorded by the geophones, which provides a more complete characterization of pavement deflection. The area of pavement deflection under and near the load application is collectively known as the “deflection basin”. One of the advantages of FWD is that multiple tests can be performed on the same location using different weight drop heights. The advantage of FWD over BB is that it is quicker, the impact load can be easily varied and it more accurately simulates the standard loading of trucks, both with respect to time of application of the load as well as the magnitude of the load. Therefore, using FWD deflection data one can characterize the existing pavement layers in terms of their layer moduli using back calculation procedures with the help of mechanistic structural models.

Once the pavement layers are characterized in terms of their present resilient moduli, overlays can be designed using mechanistic procedures.

The characteristics of important equipment or the pavement performance evaluation is documented in guidelines for Maintenance Management of Primary, Secondary and Urban Roads, “IRC, 2004.

2407.17 Intervention Criteria

Based on the objective/subjective rating of the pavement distress one can adopt a maintenance strategy to bring back the distress ratings to an acceptable level. This kind of maintenance termed, as pavement condition responsive maintenance is very effective when compared to the traditional scheduled maintenance approach.

In order to determine the intervention criteria with respect to various distress indicators, it is necessary to classify the roads. For the purpose of fixing the intervention criteria and for determining the level of pavement evaluation to be adopted the following classification.

Category-I : All State Highways and City Roads

Category-II : Major District Roads

Category-III: Other District Roads

Table -1 Intervention Criteria for PWD Road Networks

SI No	Serviceability Indicator	SH & City Roads	MDR	Other Roads
1.	Deflection	1.0mm	1-1.5 mm	1.5-2.0mm
2.	Roughness by bump integrator (max.permissible)	2500 mm/km	3000 mm/km	4000 mm/km
3.	Pot-holes/l, (max. numbers of size <100 sq cm and depth <2.5 cm)	Nil	2-3	4-8
4.	Cracking and patching repairs (max. permissible)	5 percent	10 percent	10-15 percent
5.	Rutting (max. permissible)	5mm	5-10 mm	10-20 mm
6.	Skid Resistance (Skid number by ASTM-274 minimum desirable)	50 SN	40 SN	35 SN
7.	User Information	All road signs, road markings in good condition	Major road signs, road markings in good condition	Major road signs and markings in fair condition

Pavement performance is evaluated both functionally and structurally. However, functional evaluation is more frequent than structural evaluation. A poor rating in functional evaluation leads to structural evaluation.

The two ways of carrying out functional evaluation of pavements can be summarized as follows:

- I. Qualitative approach based on subjective ratings of the above parameters and working out a single performance index (similar to PSR on 0-5 scales)
- II. Using objective measurements on rut depth, cracked and patched area, rutting, raveling and roughness using appropriate instruments and working out the performance index.

In the long run, the data on Roughness, surface distress, skid resistance and structural evaluation should be collected using suitable instruments as explained in Annexure 12-A in an objective manner. At a network level, as speed of collection of such data is also an important factor, integrated analysis units may be used for collecting data on pavement distress and FWD may be used for structural evaluation. Ultimately, an objective system of road performance evaluation should be in place as a part of the Road Maintenance Management System. In the mean time a qualitative approach of pavement performance evaluation could be attempted.

In the mean time

- A detailed qualitative rating system on each and every parameter Table-2 may be tried for State Highway & MDR.

This pavement performance evaluation when implemented in its full form should become part of a road maintenance management system, which will guide in deciding the best maintenance strategy.

The data on pavement performance evaluation could be used for arriving at workable quality assurance and quality control criteria.

Table 2
RATING OF PAVEMNT SURFACE

Name of Road:

Section:

Number of Traffic Lanes:

Rater:

Date and Time:

Distress	Rating Scale					
	5	4	3	2	1	0
Cracking						
Rutting						
Patching						
Raveling						
Bleeding						
Potholes						
Riding Quality						

Explanatory Notes

- Cracking : Good: Generally un-cracked
Fair: Single crack along the when path or localized very fine cracking.
Poor: Extensive cracking
- Rutting : Good: Deformation along wheel path up to 10mm
Fair: Deformation along when path between 10 and 20 mm
Poor: Deformation along wheel path above 20mm
- Patching : Good: No patching or potholes or localized depressions observed
Fair: Localized patching or potholes observed at some places
Poor: Extensive patching or potholes spread all along the section.
- Raveling : Good: No raveling or stripping observed
Fair: Stripping confined to localized pockets but exposed aggregate remain stable
Poor: Aggregate surface is exposed extensively and extensive raveling observed.
- Bleeding: Good: No bleeding observed
Fair: Bleeding confined to a few localized patches
Poor: Extensive bleeding spread all along the section
- Riding Quality Good: Comfortable travel inside the vehicle
Fair: Generally comfortable with occasional bumps
Poor: Uncomfortable ride with frequent bumps.

Simple qualitative rating shown in tables below could be used for other roads.

1. Measurement based on visual inspection only

An experienced engineer can rate the PCI by visual inspection of the pavement for each kilometer on a scale of 1 to 5 as under:

Description of Surface Condition	PCI
Very Good	5
Good	4
Fair	3
Poor	2
Very Poor	1

2. Based on riding comfort

A jeep or car is driven at 50 km/ hr and the riding comfort noted for each kilometer. Based on riding comfort while driving at the design speed of 50 km/hr, the PCI is assessed as under:

Riding Comfort at 50 km/ hr	PCI
Smooth and pleasant ride	5
Comfortable	4
Slightly uncomfortable	3
Rough and bumpy	2
Dangerous	1

3. Based on comfortable driving speed possible

The driver is instructed to drive at the most comfortable and safe speed possible on the road. The PCI then assessed for each kilometer based on normal driving speed as under:

Normal Driving Speed	PCI
Over 50 km/hr	5
40 to 50 km/hr	4
30 to 40 km/hr	3
20 to 30 km/hr	2
Less than 20 km/hr	1

2407.18 Performance Evaluation for New projects and Techniques

As mentioned earlier, evaluation of performance of the roads constructed by using new materials or new techniques is to be carried out to get an idea about their behavior after 2 to 3 years. The techniques of performance evaluation are similar to those described above and additional tests or methods may be employed as necessary. The results of such post construction performance evaluation will be educative which enable the implementation of corrective measures and carry out modifications in future works of similar type and design.

2407.19 Drainage Aspect

2407.19.1 Drainage is the most important aspect for proper upkeep of roads. Strength and life of the pavement greatly depends on the moisture present in and below the pavement. Performance and durability of the pavement is inversely proportional to be quantum and duration of the presence of moisture in the road structure. Failure of bituminous pavement in rainy season is mainly due to the action of moisture on the various components of pavement.

2407.19.2 Entry of Moisture

Moisture gets into the road structure through various sources like-rain water falling on the pavement, water flowing on the surface, moisture getting into pavement through cracks in the pavement, water seeping into the pavement through uncovered soil, moisture from below rising by capillary action, water getting in to the pavement by way of spring flow and pipe leaks and stagnation of water due to flooding or other reasons.

2407.19.3 Action of Moisture of Pavement Components

Once moisture finds entry into the pavement structure it acts in various ways. It saturates the soil which reduces its bearing capacity and the pavement starts sinking. Moisture present in the WBM loosens the interlocking of the metal pieces and they move from their original position disturbing the upper layers. Moisture present in the bituminous courses reduces the adhesive property of the bitumen which results in to stripping of the metal. Such loose metal under the moving rubber tyres start grinding the surface. This grinding results in to further loosening of other metal pieces in the pavement and with the sucking and churning effect of traffic the whole surface starts raveling. Water accumulated in depressions and pot holes continuously supplies moisture to lower layers weakening the whole structure for the pavement. Prolonged contact of moisture affects all the components of the pavement.

2407.19.4 Dealing with Moisture

Best approach to tackle the moisture problem lies in totally eliminating the water contact. However it is very difficult to have such an environment. So attempt should be to minimize the quantity of moisture entry and to reduce the duration of the moisture contact with pavement. This can be achieved by providing efficient drainage system to quickly carry away the surface water and quickly removing the subsoil water that has found entry into the structure. Also create such situation that the entry points of moisture penetration are effectively sealed. Problem of flooding on the road is dealt separately below.

2407.20 For New Road

- 1) A drainage layer having good permeability with inverted choke should be provided below the pavement. Thickness should be minimum 150mm.
- 2) In locations where water table is high, to prevent entry of soil particles into the drainage layer/capillary cut off, some capping layer should be provided such as geo-fabric, quarry spall, moorum etc
- 3) Drainage layer and GSB should be provided for the full width up to road side gutters and weep holes should be provided at suitable level and suitable intervals in the gutter (Fig.2407 A)
- 4) Road side edge of the open gutter should be lower than the edge of the pavement at that location.
- 5) Built up gutter should have min gradient of 1:400, however 1:300 is preferable. Invert gradient should be checked by third party preferably with sight rails.
- 6) Curb inlets / Drop inlets should be at least 25-30 mm lower than the edge of the pavement. In case of pipe laterals depth of 50mm is preferable.
- 7) Built up drains should finally lead to some natural water course or SWD system of sufficient capacity. This should be ensured by some third party inspection.
- 8) In case of foot paths proper edge gully and kerb inlet arrangement should be provided.
- 9) Before issue of work order fresh levels should be taken by the executing staff, invert levels of longitudinal drains and final disposal point should be determined. A working drawing should be prepared or the project and it should be available on the site all the time.
- 10) At the location of C.D work and bridges provision of one or two conduits cross wise and in the kerb is very useful in laying future utilities.
- 11) Road formation should be at least 300mm higher than the general ground level except where the road passes through cutting. No land development above the road level should be permitted.
- 12) Minimum camber for bituminous surface should be 2.5% however 3% camber would be more desirable.
- 13) Camber should be attempted from the formation itself, and all pavement layers should have the desired camber during construction itself.
- 14) Shoulder should have min camber of 5% and should have good permeability.

2407.21 For Existing Roads

- 1) When road work is taken for improvement or relaying etc. pot hole filling and camber correction should be done in advance.
- 2) Due to creep if the edges of the pavement are higher than the adjoining portion they should either be chopped out or leveling courses should be so adjusted that the finished surface is at desired camber.
- 3) Existing drainage system should be thoroughly checked by some experienced and responsible person. Any deficiencies noted, modifications suggested etc should be duly undertaken on priority, preferably before main work of pavement is taken up.
- 4) Leaking pipes, spring flows, chronic damage spots and cracked up portions should be investigated and proper corrective measure should be taken before the main work.
- 5) If adjoining plots are higher than the main road they should be trimmed. Alternatively a cattle trap type drain should be provided and joined to SWD system.
- 6) Edge gutter/gully, inlet etc should be examined for their levels and clearance.

- 7) Provision of shoulder drains should be made where soft shoulders exist. Similarly in case of roads in cutting and at chronic spots provision of subsoil drains should be made. (Appendix 2407 C&D)
- 8) At the end of the flyovers and ramps water flowing along the slopes should be arrested and diverted to SWD system by providing a slotted/cattle trap type drain at the foot of the slope.
- 9) Water flowing through water spouts of the flyovers should be lead through suitable pipes to the ground chambers and connected to SWD.
- 10) Wearing coat on the flyover and bridges should be 15 to 20 cm short from the kerbs. The notch formed will serve as a drainage gully. This will avoid stagnation on the bridge decking and avoid damages to wearing coat.

2407.22 Road Work Maintenance

- 1) Pot-holes should be filled timely and systematically.
- 2) Cracked up, sunken, dislodged portions should be removed fully and rebuilt in layers.
- 3) Top surface of the filled pot-hole should be flush and in camber with the adjoining surface. Smooth flow of surface water to the side drains should be ensured.
- 4) Raised bituminous edges should be trimmed and made lower than the neigh boring surface.
- 5) Pipe leaks should be attended by stopping the leaks immediately; **in case** it is not possible, a suitable out let by way of a bypass should be provided to leaking water.
- 6) Reinstatement of trenches with loose material without proper compaction gives easy entry to moisture and renders the adjoin pavement weak. Subsequent settlement of the loose fill results into local sinking which further attracts moisture and leads to failure of the pavement. Reinstatement should be with non-cohesive material compacted in layers. Top surface of the reinstatement should be regular pavement and it should be flush with the surface in level and camber. Subsequently if **it shows** some settlement it should be made good time and again, but in no case it should be kept proud.
- 7) Building debris and other heaps obstructing the flow of water should be immediately removed.
- 8) **The** system of pot-hole repairs with Pre Mix material laid in cold condition, without removing the loose material filed during monsoon, without tack coat and without rolling should be discontinued. Similarly pot-hole filling by contracting agencies needs a fresh look, as it is proving to be costly and ineffective.
- 9) Pre-monsoon and post-monsoon inspections of surface drainage system by the section in charge should be strictly enforced. It should be monitored by his superiors and test checked.

2407.23 Work Zone Traffic Management

2407.23.1 General

The purpose of any work zone Traffic Management Plan (TMP) is to ensure that the impacts of road works on the public domain, in particular with respect to temporary interruptions to vehicular and pedestrian traffic, are considered by the authority. The TMP must ensure safety to the workers, pedestrians and vehicle users at all times, and that the delay due to interruptions is minimized. The TMP should also ensure that the minimum required time is made available to the roadwork before the road is opened for traffic.

2407.23.2 Present Status of Traffic Management for Road Works

At present it appears that there is very little planning carried out for work zone traffic management for all road works of PWD. For all cement concrete road works construction is done lane wise allowing traffic on the remaining lanes. The impact of lane closure however is not being scientifically assessed. Provision of the traffic control devices and signs are also decided at the time of construction in the site. Only bare minimum work zone safety measures are being under taken by the contractor. Flexible pavement maintenance works at present are carried out during night time when the traffic volume levels are negligible. No specific traffic management measures are being implemented for these road maintenance works. One of the important problems observed in the case of road resurfacing works is that these works are opened to traffic much earlier than the minimum required curing period. A proposer work zone traffic management plan will ensure the availability of minimum required time for a roadwork before it is opened to traffic, safety at the work zone and minimum delay to the road users. Therefore, it is suggested the PWD should prepare and implement a traffic management plan for all road works. Particularly attention should be paid to requirements for smooth and safe pedestrian flow.

2407.23.3 Components of Temporary Traffic Control Zones of Road Works

The temporary traffic control zone includes the entire section of roadway between the first advance warning sign ("ROAD WORK AHEAD" sign) and the last traffic control devices ("ROAD WORK ENDS" sign). The four components of temporary traffic control zones, in the order that drivers encounter them, are

Advance Warning Area

This area notifies the driver of an impending temporary traffic control zone. This advance warning may vary from a single sign to a series of signs and / or flashing lights on a vehicle preceding the transition area. The distance the **warning** area should be placed ahead of the transition area depends on factors such as the speed limit, roadway condition, and type of road.

Transition Area

When traffic needs to be redirected from normal lanes, channelization devices are used to move traffic to a new path. This redirection should occur at the beginning of the transition area. Transition areas usually involve the use of roadway tapers. Tapers are created using a series of channelizing devices or pavement markings placed out of or into the normal traffic path. There are several types of tapers; merging, shifting, shoulder downstream, and one –lane / two –way.

Activity Area

Actual road works is conducted within the activity area. This area is made up of the worm space, the traffic space, and optional buffer spaces. The works pace is that portion of the roadway closed to traffic and set aside for workers, equipments, and material. The work space can be stationery or move as work is conducted. The traffic space is the portion of the roadway in which traffic is routed through the activity area. Buffer space is intended to provide an area of separation and security between the work site and traffic. The buffer space can be placed longitudinally and/ or laterally to the work area. Buffer spaces are optional.

Termination Area

The termination area is used to return traffic to the normal traffic path. In this area, tapers can be used to achieve rerouting of the traffic back to the normal traffic lanes. The termination area extends from the downstream end of the work area to an “END OF ROAD WORK” sign if posted.

All these four components are shown for a typical work zone in Fig. 18.1 wherein one lane is closed for maintenance.

2407.23.4 Work Zone Traffic Control Strategies

A suitable strategy from the ones mentioned below should be adopted for traffic control at work zones after assessing the impact.

Lane Constriction ie., reducing the width of one or more lanes to retain the number of lanes normally available. Lane constriction is usually the least disruptive to traffic, but is applicable only if the work area is predominantly outside the normal traffic lanes and if should are available.

Lane Closure ie., one or more traffic lanes are closed after determining that serious congestion will not result based on a capacity analysis. (Appendix 2407 F).

Shared right – of –way ie., utilizing one lane for both directions of traffic flow with flaggers or signals to coordinate the two directions of traffic or possibly traffic control signing alone for short term work zones on very low volume two lane roads (Appendix 2407 E).

Temporary by-pass, ie., total closure of the roadway in one or both directions where work is being executed, and rerouting the traffic to a temporary roadway constructed within the highway right – of –way (Appendix 2407 F). Where a temporary diversion is constructed, the geometrics of the same should be as per the standards that apply to the normal traffic lanes and the number of lanes for diversion should be decided based on the volume of diverted traffic and a minimum level of service of D should be ensured during peak hour. The pavement section for the diversion should be designed based on the diverted traffic loading and duration following the normal standards that apply to the regular traffic lane pavements.

Intermittent closure, ie, stopping all traffic in one or both directions for a relatively short period of time to allow work to proceed, then after a certain time (based on traffic volume) reopening the roadway (normally applicable on very low volume roadways).

Crossover, ie, routing a portion or all of one direction of the traffic stream across the median to the opposite traffic lanes, or utilizing the shoulder and / or lane construction to maintain the same number of lanes (Fig. Appendix F).

Use of the shoulder or median, ie., the existing shoulder ort median acts as a temporary traffic lane (Appendix 2407 F). Where shoulder lane is used for diverting the traffic , shoulders should be strengthened to take the regular traffic during the duration of closure. Earthen shoulders for the purpose of strengthening shoulder be provided with 150mm thick granular base covered with bituminous surface dressing or carpet or mix seal surface.

Detour, ie, total closure of the roadway (one or both directions) and rerouting traffic to existing alternate facilities.

2407.23.5 Impact Analysis of the Work Zone Traffic Control Strategy

For a given roadwork several alternative traffic management plans could be generated using the above listed strategies. All these alternatives are evaluated by qualifying their impacts. One of the measures that could be used to evaluate the plans is the delay to traffic which is the difference between the normal travel time and the increased travel time due to the implementation of the strategy. Capacity deficiency due to the road work is overcome by implementing traffic management strategies. The impact of each strategy is worked out. Simple speed flow curves could be used to work out the reduction in speed for each of the strategies. The best strategy that has minimum adverse impacts could be selected.

The work zone traffic management plan should also identify any interruption to bus services or bus stops and provide details of any measure to ensure continued access to public transport. Existing bus routes will be maintained as far as is reasonably practicable and any diversions necessary will be well publicized. The TMP should also ensure that satisfactory access for emergency vehicles such as ambulances, fire fighting vehicles etc is not impeded. Emergency vehicles require reasonable access to every property, along the construction route at all times.

2407.23.6 Traffic Control Devices Used in Temporary Traffic Control Zones

A traffic control device is a sign, signal, marking or other device placed on or adjacent to a street or highway. Devices should be placed by an official or public body with jurisdiction to regulate, warn, or guide traffic.

Types of Work Zone Devices

Traffic control devices within temporary traffic control zones serve essentially the same functions as traffic control devices do generally. The types and uses of the various devices used in temporary traffic control zones include:

Signs

Temporary traffic control zone signs are similar in their communication objectives to all other traffic signs. Like other signs, temporary traffic control signs are categorized as regulatory signs, warning signs, and informatory signs. Signs used at night need to be retroreflectorized or illuminated to achieve a nighttime visibility that is comparable to that in daylight. The illumination can be internal or external; street or highway lighting is not usually adequate to satisfy this requirement. Signs used in temporary traffic control zones are often relocated and subject to considerable wear and tear during handling. Therefore, they should be routinely inspected for cleanliness, visibility, excess wear, and proper positioning and should be replaced if necessary. Descriptions of specific signs are available in IRC: 67-2001.

Arrow Displays

An arrow display is a sign with a matrix of elements. The matrix, capable of either flashing or sequential displays, provides the driver with additional warning or information. The direction of movement of vehicle at diversions could be effectively indicated by these arrows.

High level Warning Device

A high level warning device, or flag tree, is designed to be visible over the top of vehicles, has at least two flags, and may contain an appropriate warning sign. They are often used in high volume urban temporary traffic control zones to warn motorists of short-term operations.

Channelizing Devices

Channelizing devices warn and guide drivers through work activities in or near the roadway and protect workers in the temporary traffic control zone. Types of channelizing devices include: cones, tubular markers, vertical panels, drums, barricades, portable barriers, and temporary raised islands. Each device is subject to specific requirements as to size, color, stripe patterns and use of retroreflectorized material.

Pavement Markings

Pavement markings provided in a temporary traffic control zone must be comparable to the markings maintained along adjacent roadways. Pre-existing markings need to be evaluated for their potential to misguide vehicles. Any such markings need to be thoroughly removed (black spray paint is not satisfactory as in certain lighting it can appear to motorists as an existing marking). All markings and devices used to delineate vehicle paths and pedestrian routes should be evaluated in differing lighting and weather conditions to assess the risk of misguidance. Descriptions of pavement markings are available in IRC: 35-1997.

Lighting Devices

It is often necessary to supplement retroreflectorized signs, barriers and channelizing devices with lighting devices at night. Floodlights should be used to illuminate flagger stations, equipments crossings, and other work areas where existing light is not adequate. The floodlights should not be used where they may create a disabling glare for drivers. A flashing beacon is a flashing yellow light used to alert drivers to special road conditions. Steady – burning lamps placed in a line on channelizing devices are effective in delineating the proper vehicle path through a temporary traffic control zone. Because warning lights attract a driver’s attention, they are used to help drivers identify road hazards.

Other Devices

Other devices include impact absorbing attenuators, portable barriers, temporary traffic signals, rumble strips, screens and lane dividers. Impact attenuators, which may be stationary or mounted on a vehicle, protect motorists from the exposed ends of barriers, fixed objects, and other hazards. Like all traffic control devices, these temporary devices must be routinely inspected to ensure they function as untended. Details of road delineators are available in IRC : 79-1981.

2407.23.7 Pedestrian Safety

The following points should be given due consideration for pedestrian safety at road works.

- 1) Pedestrians and vehicles should be physically separated (ie, by barriers, barricades, or similar items).
- 2) Pedestrian walkways should be maintained free of any obstructions and hazards such as holes, debris, mud, construction equipments, stored materials etc.
- 3) Temporary lighting should be considered for all walkways that are used at night, particularly if adjacent walkways are lighted.
- 4) Walkways should be at least 1.5m wide, and should be wider in areas of high pedestrian activity.
- 5) All hazards (ditches, trenches, excavations, etc) near or adjacent to walkways should be clearly delineated.
- 6) Walkways under or adjacent to elevated work activities such as bridges or retaining walls may require a protective roof.
- 7) Advance information is needed if the pedestrian pathway is blocked or detoured. Signs and traffic control devices should be provided at points of decision to properly guide the pedestrians along the detour. Pedestrian signals that no longer apply should be covered. Signs and traffic control devices should not be a hazard to pedestrians. Signs located near or adjacent to a sidewalk should have a 2m clearance.
- 8) Where safe pedestrian passage cannot be provided, pedestrians should be directed to the other side of the street by appropriate traffic control devices (eg. “Foot Path Closed- Use Other Side” and “Pedestrian Detour- Follow the Arrow “ signs).
- 9) Where construction activities involve sidewalks on both sides of the street efforts should be made to stage the work so that both sidewalks are not out of services at the same time.
- 10) In the event that sidewalks on both sides of the street are closed, pedestrians should be guided around the construction site.
- 11) Reflectorized traffic control devices are of little value of pedestrians. Warning lights should be used to delineate the pedestrians’ pathway and to mark hazards as appropriate.
- 12) Particular attention should be given to avoid inconvenience to senior citizens and handicapped pedestrians.

2407.23.8 Worker Safety

Worker safety is another primary objective of the TMP, Key elements of traffic control management that enhance worker safety are: Training workers about how to work safety next to traffic; Equipping workers with bright and highly visible clothing; Using barriers to separate work space from traffic; Reducing speed zones and using law enforcement; Lighting the work area; Preparing public relations efforts to reduce traffic through the temporary traffic control zone; and Closing roads.

SECTION.2500**2501. Asset Management****2501.1. Introduction**

Maintenance of all the assets is far more important than continuous creation of new assets without provision for proper upkeep. Currently the backlog of maintenance activities has caused the deterioration of structures and most of them have to be reconstructed. It is vital to the economy of the State that timely maintenance is carried out.

The maintenance activities should be properly planned and implemented periodically. For this all the assets shall be recorded in registers and regular inspection and verification done.

2501.2. Land Plans & Land Records

The land plans & land records are the basic documents of property right of the Govt. /Department. Therefore, land plan showing boundaries of the area etc. should be kept on record & updated from time to time. Sometimes part of Govt. land is given on lease to some private parties or corporations. In such cases lease proposals are approved at Govt. level & lease agreements are signed at Assistant Engineers level. The Assistant Engineer has no power to give any piece of Govt. land to any party without permission from the competent authority. In all such cases of leases of Govt. property a lease register & agreement copies of lease deed should be maintained by the Assistant Engineer for record, reference, renewal or termination of lease.

2501.3. Encroachments

The encroachments generally occur on Government land of buildings or adjoining the roads/bridges. Such encroachments should be removed with the help of revenue and police authorities then and there.

2501.4. Auction of Usufructs

The fruit bearing trees and other trees on Government land viz. along the internal road, quarters, office premises, rest houses etc. and along the PWD roads should be protected properly. Every year auction should be held for sale of usufructs. The money realised should be credited to revenue of the department.

2501.5. Dismantled Material Account

The useful materials obtained from dismantling of the old structures, buildings, roads or bridges etc should be taken on record as per provisions in section.3019.3. Before dismantling any old building, permission of the competent authority should be obtained for dismantling and to write off the structure from Building Register as per section 2901.1.3. In case of culverts the same shall be noted in the concerned register as per section 2702 and bridges as per section 2802.

2501.6 Theft of Government Property / Articles

Any theft of Government property is to be immediately brought to the notice of higher officers. Similarly, action to lodge the complaint with the police is also to be taken.

2501.7 Accident Reporting

Sometimes accidents happen on site of work involving injuries to persons, deaths, loss of property etc. All efforts should be made to give medical treatment at the earliest. Such instances should be immediately brought to notice of higher officers. Similarly, action should be initiated to mobilise support of relief/ rescue from local police/ revenue officers. The detailed reporting should follow later on. In case of major accidents the matter shall be reported.

2501.8 Erosion control and environment protection

Any maintenance activity shall also include necessary precautions for the control of erosion and leaching. In case of buildings, retaining wall and toe wall with turfing shall be done. The provisions of the guidelines for environmental protection shall be adhered to. In case of roads and bridges, erosion control shall be done by turfing or seeding and mulching as per clause 306, 307 and 308 of Standard Specification for Roads and Bridges of MoRTH.

2501.9 Maintenance Estimates

The divisional officer shall forward the maintenance requirements within his jurisdiction by end of each calendar year to the concerned planning wing who shall incorporate this in the annual budget. Once the budgets are passed the concerned Chief Engineer shall place at the disposal of each divisional officer a

lump sum amount at the start of the financial year. It is the responsibility of the divisional officer to prioritise the works in his jurisdiction within the allotted amount.

SECTION 2600

2601. Maintenance of Roads

2601.1. General

The maintenance of road is an elaborate activity and includes maintenance of basic records, maintenance of structures and tools & plants required including carrying out inspection of all the structures at regular prescribed intervals. While maintenance of State Highways and Major District Roads is the responsibility of PWD, the State Government acts as the agent of the Union Government for carrying out maintenance works on National Highways. In respect of Corporations, Municipalities and Panchayats all roads falling within their jurisdiction are to be maintained by them with the exception of certain specified roads in each Corporation, Municipality or Panchayat which Government have ordered the P. W D. to maintain. Even when roads are constructed in highest quality, over a period of time, they will show signs of distress due to the effects of increase in vehicular traffic, climatic effects and other reasons.

Traffic on most of the roads have exceeded their capacities, and do not cater to the needs of modern multi axle heavily loaded vehicles. Moreover, reclassification to higher categories is done without properly designed upgradations. Hence, this has resulted in deterioration of roads which in turn causes loss to the economy by way of increased fuel consumption, wear and tear to vehicles, accident costs and increased travel times. The need of the hour is to create a road network of desired level of service for which upgradation of existing roads shall be done in a phased manner.

Maintenance of all elements of the road is important but the condition of the pavement is the most important in predicting the performance of the road. **Appendix 2600A** details the type of distress, symptoms, probable causes and possible types of treatment. Road maintenance is required on a regular basis to keep these effects to a minimum, extend the life of the road and provide a high level of service to users. The criterion for maintenance shall be as per **Appendix 2600B**

All maintenance and repairs are to be carried out as per relevant codes and specifications of IRC and similar instruction/orders issued by the competent authority on the subject.

The basic objectives of maintenance are

- a. Affording riding comfort, convenience and safety to the public
- b. Preservation of the investment in roads and appurtenances
- c. Preservation of the aesthetics and compatibility of highway system with environment; and
- d. Accomplishing necessary expenditure of resources with continuing emphasis on economy.

2602. Road Maintenance Unit:

At each Division, there is a Road Maintenance Unit (RMU) under the Divisional Officer, Executive Engineer. It shall have the responsibility of maintaining a register of all assets with periodical updating. This may be obtained from the respective Assistant Engineer, who shall maintain current records in the form of registers (given as **Appendix 2600E to 2600F**) for all the roads and culverts under his charge. Wherever necessary the RMU shall undertake regular monitoring surveys and the reports submitted to the Divisional Officer and forwarded to the Central Road Maintenance Unit. The Executive Engineer shall prioritize the roads for maintenance for next financial year in his Division before the end of each calendar year. The RMU cell in the centre shall collect the road maintenance requirement for the entire State from respective divisions and the proposal for total fund requirements shall be incorporated in the annual budget as a planned item.

2602.1. Maintenance Planning:

The annual maintenance plan for the next financial year shall be prepared by the Executive Engineer and forwarded to the Chief Engineer before end of November. A proforma for such proposal is given as **Appendix 2600G**. Chief Engineer shall finalize actual fund requirement based on output from Road Maintenance Management System and this shall be transmitted to the Finance Department before 31st December every year. Chief Engineer shall allocate the maintenance fund to each Division at the start of every financial year.

The Executive Engineer shall arrange and execute the maintenance work based on fund allocation as regular maintenance contract or as Fixed Term Maintenance Contract. To enable this, the Assistant

Engineer shall prepare detailed maintenance estimate of the identified roads. The specifications for maintenance shall be as per Section 3000 of specification for road and bridge works of MoRTH and shall apply to all items of road maintenance works as required to carry out under the contract or as directed by the Executive Engineer. The works shall be carried out in conformity with the relevant specifications to the required level, grade and lines using approved materials. The works shall be carried out using light duty machinery or manual means provided the quality of the end product does not suffer. In execution of maintenance works, a reference is made to the IRC publications Manual for Construction and Supervision of Bituminous works and Code of Practice for Maintenance for Bituminous Surfaces of Highways, IRC 82 for guidance and compliance wherever applicable. Wherever the specification is not clear, good engineering practice shall be adopted in the construction to the satisfaction of the Executive Engineer.

2602.2. Inspection Schedule

The Assistant Engineer under the control of the road shall inspect the roads frequently at least once a month. The frequency of this inspection shall be increased during monsoons or calamities. Overseer on directions from the Assistant Engineer shall also conduct routine checking and report the condition of roads. He shall also check the condition of avenue trees from time to time and take such steps as lies within his means to prevent unauthorised cutting of avenue trees or damages to culverts, Kilometre stones, signboards etc. Should there be any accidental obstruction to traffic by fallen trees, erosions slips, damages to bridges, culverts etc., the Overseer must immediately get orders from the Assistant Engineer and provide necessary caution boards and report the fact to the Assistant Engineer and under his instructions arrange the removal of the obstruction as early as possible.

It shall be the duty of the Highway Authority to conduct annual check of the boundaries of the Highways in its charge with a view to locating and removing encroachment, if any.

2602.3. Maintenance of National Highways

Estimates for maintenance of National Highways shall necessarily give particulars of the annual requirements under this head to the MoRTH, before the commencement of every financial year. This shall be sent with full details of type of works and amount as prescribed by MORTH from time to time.

The Ministry will sanction the maintenance based on the detailed estimate submitted by the state NH wing. Normally fund shall be allotted for this head by the Ministry to the Divisions. Executive Engineer will be permitted to carry out ordinary repair works subject to availability of funds. Works under ordinary repairs will be carried out by Executive Engineers of NH wing by issuing AS and TS as per their delegation of power.

On receipt of sanction from MoRTH, technical sanction by the officer of P.W.D. as per delegation of powers and subject also to such individual items not exceeding the amount shall be accorded for this purpose.

2602.4. Maintenance of State Highways and Major District Roads

The work of maintenance on these roads may be broadly divided into the following heads:-

- (a) Ordinary Repairs
- (b) Renewal of Surface (periodic maintenance)
- (c) Special repairs.

Maintenance of roads shall be as per section 3000 of Specification for Road and Bridge works Published by MoRTH. For specific treatment of surface distress, and other maintenance of bituminous surface, the Manual for construction and supervision of Bituminous works by MoRTH and as per IRC SP 20, the Rural Roads Manual shall be followed.

2602.4.1. Ordinary Repairs

All items of routine maintenance except renewal of surface required for keeping the road in good condition and which are of a repetitive nature shall be included under ordinary repairs. The following are some of the main items normally included under this head:

- (i) Filling up potholes and patchwork to black topped surface.
- (ii) Thorough repairs including clearing of jungle growth, sectioning and forming of berms, clearing side drains
- (iii) Clearing of culvert and opening outlets.
- (iv) Filling up erosions and removal of slips.
- (v) Repairs to pitching, retaining walls, masonry works, culverts.
- (vi) Painting Signboards, Kilometer stones, Hectometer stones, Guard stones, Boundary stones, road markings etc.

(vii) Planting avenue trees and maintaining the same.

Maintenance of traffic signs and markings shall also be an inevitable component of maintenance activity.

The patchwork shall be measured by volumetric measurements of broken stones collected for the work and paid for with necessary utilization certificate.

2602.4.2. Renewal of surface:

This provides for resurfacing the road at regular intervals or when found necessary. Normally the following periodicity may be adopted for renewals.

Concrete roads	once in 10 years
Bituminous Roads	
Chipping carpet	once in 3 years
BM and AC	once in 7 years

If in any particular reach renewal has to be carried out earlier than the period mentioned above the necessity shall be specifically brought to the notice of the Executive Engineer and his sanction shall be obtained. A renewal coat shall be done after all the defects, like pothole, undulations etc. has been rectified.

A road chart shall be maintained in the form given in **Appendix 2600H** for each important road, which will give all data about the history of renewal of surfacing of different sections of the road. This will be helpful in selecting the reaches requiring renewal or special attention.

The funds available under renewal shall not be utilized to upgrade the surface of the road. All up-gradation shall be considered as original work.

The renewal of surface shall be done as per provisions in Section 3000 of Specification for Road and Bridge Works published by MoRTH

2602.4.3. Special Repairs

Special repairs are such items of repairs, reconstruction, or additional construction found occasionally necessary to keep the road in good condition. These may be divided into

- a. Special repairs to roads, such as construction or reconstruction of retaining walls, raising a portion of the road, widening of pavements, maintenance of shaller, construction of drains etc.
- b. Special repairs to culverts up to 6mts span, construction and maintenance of road side drains These may include reconstruction as well as construction of new culverts if found necessary.
- c. Emergency works related to VVIP visit.
- d. Repairs to flood damages.
- e. Repairs to drought and other natural calamities.

The nature of repairs consequent of floods, drought and other natural calamities may fall under one or other of the above categories or may be a new type of work such as training of a river course etc. Even when a flood damage work comes under the category of special repairs to roads or to culverts, this is kept distinct from original repairs mentioned in (a) and (b) above since the financing is from an allocation specially earmarked for this purpose.

Adequate signboards and road markings, not provided as per requirements, shall also be included in special repairs.

Necessary provisions shall be made in the estimate for carrying out periodical maintenance including clearing of drains, jungles, painting of sign boards, road markings and shaller maintenance etc. during the defect and maintenance liability period.

For renewal coat, the defect and maintenance liability period shall be 3 years. All the periodical maintenance including clearing of drains, jungles, and shaller maintenance etc. in the defect and maintenance liability period shall be done by the contractor for the up keep of the road. After the end of 3 years (defect and maintenance liability period), ordinary repairs (annual maintenance) shall be done for next 2 years. After end of 5 years, surface renewal shall be done.

2602.5. Schedule of Maintenance operations.

Maintenance of roads involves several operations some of which can be done during rainy season and others which can be done only in dry weather. All bituminous works shall be carried out only during dry weather. A timetable for the various operations in the different roads under each section shall be drawn out and adhered to by the Assistant Engineer.

The table on the Schedule of maintenance operations given in **Appendix 2600I** may be used as a guidance in preparing the time table over a two year period.

Periodicity of Routine Maintenance Activities

No.	Name of item	Frequency of operation in the year
1.	Clearing of road side gutters	Twice
2.	Pothole filling (WBM & BT)	Once
3.	Filling up edges of asphalt surface of excavating borrow pit.	(i) Single lane T.I*. 0-1000 | Twice T.I. 1000-5000 | Four times (ii) One and Half lane T.I. 0-1000 | Once T.I. 1000-5000 | Twice T.I. Over 5000 | Four times (iii) Two lane T.I. 1000-5000 | Once T.I. Over 5000 | Twice
4.	Dressing of berms	Once
5.	White washing/ Painting guard stones/ Kilometer Stones/Hectometer Stones, Boundary Stone, Road markings	Twice
6.	Fixing/ Painting disturbed caution board/Village name board/ Traffic sign boards, etc	Once
7.	Refixing displaced guard stones/ Kilometer Stones/Hectometer Stones, Boundary Stones	Once
8.	White washing and numbering of trunks of trees	Once
9.	Cutting of branches of trees, etc.	Once
10.	Topping of W.B.M. blind age operation including Picking of loose metal	18 times
11.	Maintenance of catch water drains	Once
12.	Clearance of C.D. works	Twice
13.	Clearing of wild seasonal growth on berms	Twice
14.	White washing parapets of C.D. Works	Once
15.	Earthwork in berms, de-silting of drains, etc.	As per actual requirement

*T.I. = Traffic Intensity

Supply and stacking of materials shall be done as per section 514 of specification of road and bridgework by MoRTH

2602.5.1. Important points to be attended to when carrying out maintenance operations

This includes thorough repairs, clearing jungle, clearing drains and culverts etc. The side drains shall be cleared off all jungle growth and obstructions and graded so as to have proper slope. All overhanging jungle growth, which may obstruct traffic or vision, shall be cut along with such repairs. All unauthorized advertisement boards, banners and arches across and along the roads shall be removed. In the case of masonry works, if any jungle growth is observed, the same shall be rooted out. The site or work spot shall be cleared by the contractor after construction by removing waste material like aggregate wastes, dust, timber woods, ashes etc and disposed according to the environmental guide lines.

2602.6. Maintenance of shoulder

This is an important part of maintenance activity and shall be done as per section 3003 of MoRTH. Exposed earth berms above the level of road surface shall be restored to original profile so as to facilitate easy access and drainage.

2602.7. Painting and Maintenance of Traffic signs

Maintenance of traffic signs and road marking including painting of bridges and culverts parapet, kerbs, Kilometer stones, Hectometer stones, Boundary stones and guard stones are part of maintenance activity. Road signs (other than enameled/ Reflective signs) shall be painted legibly once a year. All these works shall be done as per the section 800 of MoRTH Specifications for Road and Bridge Works.

2602.8. Defects of Roads

The various defects on flexible pavements are cracks, potholes, bleeding, corrugations, depression/ settlement, disintegration, ravelling, rutting shoving and upheaval. In semi rigid and rigid pavements, usual defects are blowup, pumping, reflection cracks, scaling and spalling. The details of

various defects are given in chapter 11 of IRC SP 20. The maintenance practices shall conform to MORTH clause 3000 and the chapter 9 of “Manual for Construction and Supervision of Bituminous Works”.

2603. Special types of pavement rectification courses

2603.1. Slurry Seal

Slurry seals are mixtures of fine aggregate, portland cement filler, bitumen emulsion and additional water. When freshly mixed, they have a thick consistency and can be spread to a thickness of 1.5 - 5 mm. They may be used to seal cracks, arrest fretting and fill voids and minor depressions, to provide a more even riding surface or a base for further treatment; they may also be used on top of a single coat surface dressing.

The materials to be used, construction operations, surface finish, quality checks and opening to traffic shall be as per the specifications of MORTH clause 516.

2603.2. Fog Spray

Fog spray is a very light application of low viscosity bitumen emulsion for purposes of sealing cracks less than 3mm wide or incipient fretting or disintegration in an existing bituminous surfacing, and to help reduce loosening of chips by traffic on newly finished surface dressing.

The materials to be used, construction operations, surface finish, quality checks and opening to traffic shall be as per the specifications of MORTH clause 518.

2603.3. Crack Prevention Course

This clause covers the provision of Stress Absorbing Membrane (SAM) and Stress Absorbing Membrane Interlayer (SAMI) as measures to inhibit the propagation of cracks. A SAM is an elastomeric bitumen rubber membrane, which is laid over a cracked road surface, together with a covering of aggregate chips, in order to extend the life of the pavement before major treatment is carried out. SAM can be laid as a single coat or a double coat. A SAMI is a layer which is applied to a cracked pavement surface but which is followed (within 12 months) by the application of an overlay course. A SAMI may be a material similar to that used for a SAM. It may alternatively consist of a bitumen-impregnated geotextile.

The materials to be used, construction operations, surface finish, quality checks and opening to traffic shall be as per the specifications of MORTH clause 522.

2604. Planting and Maintenance of avenue trees

Avenue trees shall be planted on roadsides as per environmental guidelines in practice. Planting shall be carried out in the early part of the rainy season so that the tree saplings can take root and grow. Suitable guard fences shall be provided for a height of 1½ metres to protect the young tree from cattle, until it reaches sufficient maturity.

Avenue trees shall be properly numbered and a register of avenue trees maintained in each sub-division vide form given in Appendix 2600J. The numbering shall be clearly made after stripping the bark for an area not less than 15 cm. x 15 cm. at height 1.2 metres from ground level and facing the road. The numbering shall be checked and re- numbered once in every five years.

2604.1. Auction of Usufructs

The usufructs of revenue yielding trees shall be properly disposed. The right of enjoying the usufructs may be sold by auction or tender and the amount realised credited to P.W.D Revenue. It shall be ensured through suitable conditions in the auction or tender notice that the person who is enjoying the usufructs does not cause any injury or damage to the tree as such. This right may be auctioned either for a year or for such longer period as the Executive Engineer thinks fit.

The Overseer under the control of sections of road shall keep a careful watch of the avenue trees. If any unauthorised attempt to cut, damage or remove avenue trees is observed he shall take immediate action to protect Government property and also concurrently report to higher officers and lodge complaints with the police.

In the case of dead trees and decayed branches of trees, the Assistant. Executive Engineer in whose jurisdiction the tree exists has the power to authorize cutting and removal of such dead tree or branches. When a tree or branch is in a condition as to cause damage to the road or adjoining property and the removal of such dangerous tree or branch is imminent, the Assistant Engineer may order its removal in anticipation of approval of the Assistant Executive Engineer after making a report to the Assistant Executive Engineer explaining the circumstances. In all cases where a living tree has to be cut, sanction of the Executive Engineer shall be obtained.

Branches of avenue trees shall have to be cut to maintain sight distances from Road safety point of view. It may also happen that branches be cut for maintenance of or extension of electric lines, telegraph lines or telephone lines. In the case of maintenance of existing lines, the authorities under the control can cut the obstructing branches in order to restore service quickly without prior intimation to P.W.D. In the case of extension, the Executive Engineer under the control of the concerned road shall be informed of the proposal by the authority concerned. Even here the authority under the control may arrange the actual cutting of branches, after intimating the Executive Engineer P.W.D. All branches, leaves etc. cut during such process shall however be disposed by the P.W.D. For this purpose, the Overseer shall arrange to collect the branches etc., in suitable places and help in disposal as directed by the Assistant Engineer. Roadside arboriculture could be a separate contract to the maintenance works.

2605. Kilometer stones.

Kilometer stone and 5th Kilometer Stones as per type designs and colour scheme shall be planted on all the roads as per IRC 8 and IRC 26 for 200-meter stones. They shall be placed clear of the shoulders of the road so as not to obstruct traffic but shall be in such a position as to be quite visible. They shall be maintained clean and legible always. The provision of kilometer stones and 200 meter stones, wherever absent, shall be taken up as part of renewal coating or special repairs.

2605.1. Boundary Stone

Standard boundary stones as per IRC: 25-1967 are to be laid in both boundaries of the road so as to identify encroachments if any in the P.W.D. land during inspection of the roads. The boundary stone shall be the responsibility of the Assistant Engineers and wherever absent shall be brought to the notice of the higher officers and installed then and there without waiting for any renewal work or special repairs.

2606. Advertisement Board

In the case of National Highways advertisement boards shall not be erected without the sanction of MoRTH.

For all other roads in the state, the authorities under the control of the road can permit display of advertisement boards after collecting prescribed fees, which shall be remitted directly to Kerala Road Fund Board. Any displays within the right of way shall be permitted only by the Highway authority who is the Executive Engineer, P.W.D, who while granting such permit, shall be careful to see that following are not allowed.

- (a) At or within 100 metres of any road junction.
- (b) Where the planting of such boards is likely to obstruct the vision of the Driver.
- (c) At hairpin bends of curves, approaches of bridges.
- (d) Near prestigious buildings, hospitals, educational institutions etc.
- (e) Within 50 metres of any of the signboard erected.
- (f) In such a manner as may obstruct the vision or distract the attention of the driver of a vehicle on the road.
- (g) To mar the aesthetic appearance of this background especially in localities which are predominantly residential or where the national scenery is likely to be spoiled by such display.

National Building Code Part 10 Section 2 also provides the guidelines for display boards.

The highway authority may permit the display of advertisements in the typical formats on the railings fences and bus bays built under private sector participation after levying the prescribed fees/ rent, which shall be deposited to Kerala Road Fund Board. This agreement shall be renewed annually or a new agreement executed. The Highway Authority has the power to order removal of all unauthorised display of advertisements and other encroachments.

2607. Cutting roads/ overhead crossing

For any work involving the opening of the PWD roads, the road cutting protocol as per Appendix 2600K shall be followed. It shall be unlawful for any person or authority or agency intending to construct, place, maintain or carry any cable, wire, pipe, drain, sewer, channel of any kind through, across, along, under, in or over any PWD road to make an excavation/ Crossing in or disturb the surface of any PWD road without written permission from the Highway Authority, whose decision shall be final and binding.

Application for permit for road cutting shall be submitted to the Highway Authority in Form No. I (given in Appendix 2600L) and after examining the urgency the Highway Authority shall issue the permit in Form No. II (given in Appendix 2600M). Upon receipt of the permit from the Highway Authority, the person or authority or agency intending to dig the road, shall execute an agreement/Memorandum of Understanding in Form (given in Appendix 2600N), before taking up the work, as per GO (Rt) No.684/09/PWD dated 27/5/2009 of Public Works (H) Department.

2608. Encroachments

Kerala Highway Protection Act empowers the officers of the department i.e. Executive Engineer (Roads Division) and his subordinate officers to take action for removal of encroachments with the help of district/ municipal and Police administration.

Section 2700

2701. Maintenance of Bridges

2701.1. General

Bridges are vital links in the highway network and if a bridge goes out of commission for any reason, the resultant disruption of traffic seriously affects the capacity and efficiency of the network. Highway structures, both old and new have to be maintained in a traffic-worthy condition to facilitate uninterrupted flow of traffic. For this, regular and systematic inspection of the structures shall be made by responsible officers to find out defects or deterioration of the various parts and urgent action taken to remedy the defects.

2702. Maintenance of records of bridges

For recording maintenance of bridges, the respective Assistant Engineer shall maintain a bridge register. The records in the form of registers (given as Appendix 2700 A & B) for all the bridges under his charge shall be kept updated. The report shall be submitted to the Division office and the Executive Engineer shall forward the same along with his recommendation to the higher authorities. However, for each bridge, there shall be two reports

- i) Original bridge report
- ii) Inspection report

2703. Inspection

Periodical inspection shall be conducted for all bridges as per IRC guidelines. Weak bridges shall be inspected more often according to necessity and appropriate steps shall be taken to remedy defects if any noticed.

2703.1. Routine inspection

This involves visual assessment using conventional standard tools to determine obvious deficiencies in the bridge structure, which might lead to traffic accidents or cause high maintenance and repairs cost, if not attended promptly. The frequency of routine inspection shall be at least once a year but preferably twice a year before and after monsoon. However, bridges located in high altitude terrain prone to effects of landslides and bridges in severe exposure conditions shall be inspected twice a year, i.e. before and after monsoon. In general the designation of the inspecting officer may be as per table 2700.1, but the same can be altered depending upon the importance of the work.

Table 2700.1 Minimum Yearly Inspections by Engineers

Designation	Type of Structure	Test Checks
Assistant Engineer	All culverts and bridges of span less than 30 m	
Assistant Executive Engineers	All minor bridges of span less than 60m, causeways of like length	Culverts inspected by Assistant Engineer especially those in a dangerous condition
Executive Engineers	All major bridges of span greater than 60 m and less than 200m	Bridges and culverts inspected by the subordinate officers especially all minor bridges marked weak and dangerous.
Superintending Engineers	All bridges of span greater than 200 m and all pre-stressed concrete, continuous structures, suspension bridges, cable stayed bridges and special structures	Above cases especially those marked as weak and dangerous.
Chief Engineer	Bridges above 500m in length	Any Bridges

The routine inspection shall be as per Appendix 2700C. The inspection reports shall be submitted to higher officers within 10 days from date of inspection.

The following instructions may be followed as an aid to systematic inspection.

2703.2. Waterway: Conditions in the stream bed shall be noted as to adequacy of channel afforded by the existing structure, risk of scour that may endanger the foundation, presence of obstructions such as drift, logs, undergrowth, stumps of old piers etc. that may be diverting the current so as to cause undermining of the foundation and need for any bank protection to keep the channel properly confined.

2703.3. Foundation and Substructure:

(a) Timber and steel Piles: Piles supporting Timber Bridge shall be inspected carefully at and below the ground line for any decay. A crow bar with one end sharpened to a long tapering point and the other end provided with a chisel face is a very useful tool in such an examination. It can be jabbed in to a pile to disclose deterioration not apparent on the surface and to determine the extent of sap rot. Piles in which the diameter of sound materials has been reduced to 15 cm or less shall be marked for replacement. Sills, bottom of posts and mud sills for trestle piers shall be similarly tested. Steel or CI tubular piers shall be carefully examined for corrosion in rivet or bolt head connecting the cylinder sections. Examination shall also be made to note whether there has been appreciable movement or sinkage of the tubes due to impact of heavy loads on the structure; if so additional footings or bracings may be needed. If the tubes are out of plumb, it shall be checked whether this is due to undermining or the lack of proper bracing or inadequate support below.

(b) Concrete or masonry piers or abutments-These shall be examined for damages if any arising from impact of floating matter or undermining or cracks. Further, they shall be examined whether they are plumb. If cracks exist, the cause shall be properly investigated so as to choose appropriate remedial measures. In the case of masonry abutments any tendency of bulge shall be particularly noted as this will indicate excessive lateral pressure. When any such defect is noticed, corrective steps shall be taken to relieve such pressure.

2703.4. Superstructure:

Where flooring is provided as in culverts and small bridges, any upheaval or sinkage in the flooring shall also be carefully noted and corrected. Where the deck is of reinforced or pre-stressed concrete, the examination shall cover the following:

- (i) Expansion joints and bearing plates examined to ensure that they are functioning properly and that their lubricating arrangements are satisfactory.
- (ii) Drainage facilities verified to see that there is no collection of water in any part of the structure and that water is drained easily.
- (iii) Roadway surface checked to see whether there is excessive scaling or unevenness.
- (iv) The bottom and sides of girders of slabs checked to note whether there is any honeycomb area exposing reinforcement and further whether any cracks appear on such parts.
- (v) Kerbs and handrails to be checked for any spalling and exposed reinforcements.

The inspection of **Steel trusses** shall include the following points.-

- (i) General alignment of the span to see whether in the case of "through Bridges" the end posts and top chords are straight and in line. Any buckling would indicate that the structure has been overloaded.
- (ii) Whether any of the structural members is kinked or rusted or has in any other manner suffered deterioration.
- (iii) Where there is excessive deflection of any member.
- (iv) Whether any of the rivets and bolts in important junctions has worked loose.
- (v) Whether the conditions of end shoes and rollers are good.

The examination of Timber Trusses shall cover the following:-

- (i) Whether there is any noticeable sag. If sag is present, note whether it is due to failure of splices. Improper adjustment of vertical rods or crushing or diagonal members.
- (ii) The condition of the bearing and the caps over the pier piling.
- (iii) Whether all bolts through splices packing blocks and cross bracing are tight and in good order.
- (iv) The condition of the stringers.
- (v) The condition of the stringers as seen from the bottom particularly with regard to full bearing on pier caps and indications if any, of crushing.
- (vi) Examination of the deck and hand rails from roadway.
- (vii) Whether all bolts in the deck are properly tightened or have become loose due to shrinkage of the timber.
- (viii) The condition of the underside of the decking.

2703.5. Culverts: The waterway shall be examined whether it is obstructed by jungle growth, or silting etc. In the case of pipe culverts, examine whether the pipes have gone out of alignment either vertically or laterally and also whether any of the pipes has cracked. The condition of the headwalls shall also be noted particularly to see whether they are plumb and free from cracks.

To facilitate proper routine inspection reporting, a simple check-list as suggested in IRC:SP: 35 shall also be used.

2703.6. Principal inspection

This is a more intensive and detailed inspection involving close examination of elements of structure with a purpose to determine the nature and degree of distress in any component of a bridge. It will primarily be close visual assessment supplemented by standard instrumented aids. Detailed inspection of foundation shall also be included and may involve underwater inspection wherever appropriate. The first principal inspection shall be conducted before the expiry of defect liability period of contract but not later than 6 months after completion and opening of the bridge to traffic. The frequency of principal inspection thereafter shall not be more than 3 years. This inspection shall be carried out by a senior level engineer against a comprehensive check-list

Underwater inspection: Visual examination of the surface may be done after removing marine growth like coral deposits, algae, etc. Detailed inspection for obtaining more information of deteriorated areas shall be done after clearing the surface growth as to enable closer inspection. Underwater inspection is a highly specialized activity and as such shall be entrusted only to competent agencies experienced in underwater inspection. Such agencies shall be carefully briefed on the components to be inspected and the nature of defects to be inspected. Close circuit television may be used where the water is reasonably clear. Where visibility is poor, portable echo sounding equipment can be used to provide a reasonably accurate profile.

2703.7. Special inspection

This shall be undertaken in the event of unusual occurrences such as strong earthquake, accidents, passage of unusual loads or floods, heavy impact of barges or floating debris on substructure and/or foundations, major weaknesses noticed during routine or principal inspection, unusual settlement of foundations and substantial changes of traffic pattern. When any bridge of similar design and constructed almost at the same time are showing some distresses, all such bridges may be subjected to special inspections. Such inspections may require a good deal of supplementary testing and structural analysis and will invariably require detailed involvement of design organizations and experts in the relevant fields, who shall be senior level engineers.

2703.8. Inspection procedure

The activities scheduled during the inspection of the bridge shall be planned in detail including sequence of inspection. Where mobile bridge inspection unit is used, the inspection shall be carefully planned beforehand so as to minimize the period of use of such equipments as the hourly cost of use of such a unit is quite high and it obstructs one lane of traffic on the bridge. The inspection shall follow a pre-determined pattern to ensure that no component is overlooked.

The inspection shall be undertaken in those periods of the year, which offer the most critical evaluation of the performance of the structures as suggested below:

	Items	Time of inspection
(a)	Foundations, protective works, scour effects, maximum flood level, etc.	During and after monsoons
(b)	High structures	During and after season of high velocity wind.
(c)	Bearings and expansion joints	During extreme seasons and after floods.
(d)	Bridges in hilly terrain	Before and after monsoons.

2703.9. Means of access

Appropriate means of access are a pre-requisite for all the three forms of inspection. For every means of access, special emphasis shall be laid on safety, ease and convenience. Due consideration shall be given at the design stage itself to the provision of proper means of access taking into account individual requirements of the structure and its components such as type of structure, topographical, local and climatic conditions of the bridge site, height, minimum water level. The possible means of access can be of the following type:

(a) Built-in access

Manhole, Built-in ladders and Permanent catwalks.

(b) Semi-mobile access:

Access ladders, Catwalks, Platforms, Inspection pits, Planking & scaffolding, etc. and Semi-stationery inspection equipment.

(c) Mobile equipments:

Equipment operating under the bridge from river bed/water barges, Equipment operating from the bridge deck and Mobile inspection unit.

128.3.7 Guidelines

Detailed guidelines for highway bridge inspection and maintenance are contained in the following and the same should be invariably followed.

- i) IRC SP 35 "Guidelines for Inspection and Maintenance of Bridges",
- ii) IRC Special Publication No 18 "Manual for Highway Bridge Maintenance Inspection"
- iii) IRC: 52-1998 "Bridge Inspection's Reference Manual".

2703.9.1. Inspection Report

The inspection report shall be in the prescribed formats. Properly referenced sketches or photographs shall be used to illustrate the defects and condition of the bridge. Free hand sketches shall be made during the inspection at the site itself. The size and location of the defects shall be dimensioned though the sketch itself need not be to scale. For taking photographs, reference number of the bridge and the location of the defects may be written in colour at the appropriate place on the bridge. Apart from reporting defects and deficiencies any proposals or recommendations for strengthening and repairs of the affected components shall also be included.

2703.9.2. Follow-up action

The Assistant Engineer-in-charge shall immediately attend to minor points or shortcomings noticed during inspection. However, in case of any important or major shortcoming / distress noticed either during routine inspection or principal inspection, the matter shall be reported to the senior level Engineer and the latter shall decide further line of action in consultation with the Design Wing/Consultants, if he considers it necessary and give detailed instructions as to whether special inspection is called for.

If during the inspections any bridge is found to indicate distress of serious nature leading to doubt about structural adequacy, the bridge will have to be evaluated for its load carrying capacity.

If the assessment shows the bridge to be inadequate for the design loads, one or more of the following actions shall be taken:

- The load on bridge shall be restricted to its assessed capacity. The condition of the bridge shall be monitored by special inspection at intervals not exceeding 6 months.
- The bridge shall be closed for all traffic where the rated capacity of the bridge is lower than the lowest level of traffic load expected to ply on it.
- Replacement or strengthening of the bridge or its affected part shall be undertaken.

2703.9.3. Remedial measures

The purpose of detailed inspection as outlined above is to find out whether damage or deterioration has occurred in any part of the structure and if so to take appropriate remedial measures. The inspection report of each bridge shall contain a specific remark as to the works necessarily to be taken up based on the results of such inspection. These works shall have the highest priority regarding maintenance of bridges. In addition to such special works, certain works of a routine nature shall invariably be carried out in respect of bridges and culverts. These are. -

- (i) Keeping the water clear.
- (ii) Where there is any growth of vegetation, shrub, etc. in the masonry or concrete part of the structure, the removal of such vegetation and steps to prevent such growth.
- (iii) Wherever bearings are provided the greasing or oiling of such bearings.
- (iv) Periodical painting of steel and cast iron structures of parts of bridges. Normally painting shall be done once every year unless special circumstances warrant changing the periodicity.
- (v) Wherever scours are noted, filling up the scours with stones of suitable size in such a manner as is found best suited to circumstances.
- (vi) Wherever cracks, spalling of concrete, disintegration etc. are noted in wearing coat, drainage spouts, hand rails, footpaths and construction joints shall be rectified.
- (vii) Corrosion of reinforcement shall be attended.
- (viii) Missing and broken footpath slab shall be replaced immediately.

2704. Repair and Rehabilitation of Bridges

All bridges are to be kept in good condition and their rehabilitation and strengthening needs shall be attended to as and when they arise. It is now well recognized that bridges not only require systematic maintenance but also strengthening or rehabilitation during their service life. IRC: SP-40 "Guidelines on Techniques for Strengthening and Rehabilitation of Bridges" provides guidance on basic approach to repair and rehabilitation, identification, assessment and diagnosis of distress, repair materials and repair and strengthening techniques to be adopted in respect of concrete bridges. These guidelines may be followed while undertaking rehabilitation or strengthening of concrete bridges.

2704.1. Steps Involved in Repair and Rehabilitation

Various steps involved in arriving at an appropriate solution to the problem of a distressed bridge and implementation of remedial measures can be broadly identified as:

- i) Identify signs of distress and need for rehabilitation through routine inspection and study of construction drawings.
- ii) Carrying out special inspection by expert team.
- iii) Investigation of type and extent of distress and the causes thereof based on in-situ and laboratory tests.
- iv) Analysis of investigation data supplemented by structural analysis and formulation of detailed plans for repair or strengthening.
- v) Implementation of repair or strengthening measures.
- vi) Documentation of repair works done.
- vii) Evaluation and monitoring of rehabilitation measures.

2704.1.2. Repair materials

Selection of a repair material must be based on an evaluation of damage, characteristics of the repair material and local conditions. Repair material must be compatible with the concrete being repaired. The selection of material depends on many factors such as physical and chemical properties, mechanical response, long-term durability, cost and record of field performance.

2704.1.3. Techniques of repair and strengthening

Repair and remedial measures vary according to the location, form and severity of distress of deterioration. These may range from protective coatings or patch repairs in the case of mild deterioration to reconstruction or replacement of key elements in the case of severe distress. Different repairs and strengthening techniques have been described in IRC: SP-40. Some commonly used techniques of repair and strengthening of distressed concrete bridges are as follows:

- i. Patching and grouting: Patching is carried out for repair of deep and wide cracks and for replacement of spalled concrete. Dry-pad mortar or conventional replacement mortar are normally used for filling cavities and around rebars. For very large areas concrete may be used. Cracks are also repaired by means of pressure grouting with epoxy resins for fine cracks and Portland cement grout for larger cracks.
- ii. Hydro demolition: Hydro demolition technique involves selective removal of damaged concrete by means of one or more high speed water jets without using any abrasive. Hydro demolition is unanimously accepted as the best process for concrete removal.
- iii. Vacuum grouting: Vacuum grouting with epoxy resin or cement grout can be used for filling up voids in cable ducts. The equipment used sucks the air out of the cavity and then via a relay valve presses the injection material into the cavity.
- iv. Epoxy injection: Epoxy injection for sealing fine cracks as small as 0.05mm shall be applied. The epoxy is injected under pressure to penetrate the very fine and tortuous cracks that may exist. Ensure good quality of epoxy resin, correct selection of equipment and experienced operating personnel for the application.
- v. External pre-stressing: External pre-stressing consists of adding cables placed externally to the girders with new anchorages at suitable locations. It can be used to compensate the loss of pre-stress in the cables and partly/fully restore the bridge deck to its original serviceability level.
- vi. As the external cables are fully exposed and do not have concrete cover, they shall be encased in either a strong High Density Poly Ethylene (HDPE) tubing or rigid metallic pipe protected against corrosion by special coating. Pressure grouting of external pre-stressing cables after tensioning is essential. Special care shall be taken while drilling holes or cutting recesses in the structure for fixing anchorage assemblies to ensure that the existing pre-stressing tendons are not damaged.
- vii. Epoxy bonded steel plates: Steel plates bonded to concrete surface with epoxy structural adhesive can strengthen RCC members in flexure and shear.

- viii. Full depth concrete overlay/deck slab replacement: Where deterioration of large areas of concrete surface of bridge decks has occurred, it may not be possible to repair it by crack repair or patching. In such cases, a full depth concrete overlay may be required. Similarly, where the deck slab has become structurally weak due to loss of cross pre-tress or other reasons, complete replacement of the deck slab may have to be resorted to. The overlays can be of dense Portland cement concrete with special quick setting admixtures of latex modified cement concrete. They shall be bonded structurally to the underlying old concrete and shall match the underlying concrete in thermal properties. In all such cases of overlays or deck replacement, the work can be carried out over half the width of the deck while permitting traffic on the other half. Traffic management or restrictions may be required during the course of the work.

2704.2. Repairs to Masonry Structures

Existing masonry bridges are sometimes considered as historical landmarks and need preservation. Strengthening and widening will, therefore, mean maintaining the same appearance. Widening is usually not possible but strengthening can often be done. The general defects and remedial measures for arch bridges in stone or brick masonry are as follows.

2704.3. Loss of Bond for the Crown stone

Flat jacks have been successfully used for pushing the stone back to its original position. Generally, low pressure cement grouting is done to strengthen the old mortar. The mortar is sometimes replaced by epoxy mortar also, though epoxy is not ideal.

2704.4. Longitudinal cracks along the direction of traffic

Rake mortar joints and refill with cement mortar. However, it must be mentioned that the depth of penetration is important, as usually it is not possible to suspend traffic. The portion of earth fill shall be removed to ensure that penetration is limited to masonry only. Fine cement grouting (injection) shall be adopted for remedial measures.

2704.5. Transverse cracks

Injection of cement will provide a good bond between stones and brick masonry

2704.6. Strengthening of arch rings

The arch ring can be strengthened in two ways - by adding material to the - intrados or to the extrados. Adding to the intrados causes the least disturbance but is more difficult to complete successfully. Also it results in a reduction in headroom or clearance, which is often restricted, and will, in most cases be the cause of new damage to the intrados as experienced on many bridges even where the headroom/clearance satisfies legal limits. Extra material may be placed by shuttering and pumping concrete (which is difficult to compact at the crown) or by fixing a mesh to the intrados and spraying concrete. In both cases, any shrinkage of the new concrete will tend to make the old and the new material separate radically. Also these impervious rings prevent natural drainage between the stones or brickwork of the arch so that special provision must be made to deal with water or under severe climatic conditions. Sprayed-on concrete will in any case change the appearance of an arch constructed of stone, brick or a combination of the two.

A more effective, but at times a more expensive, treatment is to remove the fill and cast the extra required thickness on the extrados of the arch. Usually, a full ring is cast but occasionally only the end quarters are strengthened to act as cantilevers and reduce the effective span of the arch. Normal concrete placing techniques are satisfactory. Replacement backfill may be with normal or lightweight concrete. The latter will reduce dead load on the foundations but may also reduce the factor of safety for stability of the substructure.

Another expedient which is satisfactory where the increase in load carrying capacity is relatively small, especially for small span bridges is to cast slab at road level to act as an auxiliary deck which spreads the wheel loads.

For cracks in arches, grouting with cement, at pressure 4 to 6 kg/sq.cm is sometimes quite effective, through care shall be taken to see that pressure will not damage the surrounding masonry.

2705. Repairs to Steel Structures

2705.1. Deck replacement of older steel bridges

Many of the old bridges (usually truss or arch bridges) have either warped steel plates with a bituminous surfacing or a concrete deck. Due to insufficient waterproofing, the steel plates are often corroded. Bridge decks can be replaced by new concrete decks or by new orthotropic steel decks. Usually, when a reduction in dead load or additional widening (adding cycle or pedestrian lanes) is necessary, replacement by an orthotropic steel deck is preferred. Bolting is the preferred method of connecting the

new deck system to existing structural members.

2705.2. Strengthening of structural members

Strengthening usually involves more conventional techniques such as installing new diaphragms to existing double compression members (increasing buckling strength) strengthening or replacement of diagonals. Plate girders may be strengthened by external pre-stressing cables, anchored and fixed on the web in the required parabolic curvature acting in a similar way as in pre-stressed concrete. Strengthening is sometimes concerned with compression failure and has involved the addition of stiffeners to flanges, webs, and diaphragms.

2705.3. Repair of cracks

Crack repair methods depend on the root cause of crack initiation. The structure and especially those components, which influence the overall safety of the structure, shall be analyzed. Action to be taken when a crack is detected or suspected in welded steel bridge girders. Repairs can be made by techniques such as drilling holes at the crack tip (this shall only be done in less sensitive locations), cutting out the cracked material and bolting plates in place, cutting out the crack and re-welding with a higher class weld (e.g. increasing the size and penetration of a fillet weld) strengthening the connection by introducing stiffening and by changing the structural action so that loads are supported in a way that prevents high stress range from developing.

2705.4. Underwater welding

Arc welding has become an accepted procedure in underwater construction, salvage and repair operation.

2705.5. Use of steel arch superposition scheme

This can be used to strengthen old truss bridges. The strengthening scheme consists of superimposed arches, hangars and additional floor beams.

2705.6. Excessive vibrations

Suitable structural alterations and increased damping for which a specialist in dynamic behavior of structures may have to be consulted can overcome these.

2706. Monitoring

After the rehabilitation/strengthening of the structure is completed, it is essential that the bridge structure is kept under observation and its condition monitored regularly so as to ascertain its performance and the efficacy of the measures adopted. The monitoring may involve inspections at more frequent intervals, carrying out of certain laboratory and field-tests as well as condition surveys and measurements to detect even small strains, movements, changes in deformation etc.

SECTION 2800

2801. MAINTENANCE OF BUILDINGS

2801.1 General

All Government buildings are to be maintained properly. As a matter of convenience, heads of various departments of the State are authorized to arrange and carry out maintenance works of buildings under their administrative control provided the annual maintenance cost of any building or group of buildings in one campus does not exceed Rs. 1,00,000 in each case and the estimate does not exceed 10% of the capital cost of building. This shall be intimated to the PWD. In addition, departments other than P.W.D, which are having engineering wings under them such as Harbor Engineering Department, are allowed to carry out maintenance works of all the buildings under their administrative control. Quasi Government Organizations and local bodies and Government owned corporations attend to maintenance of their buildings even if the buildings were originally put up at Government cost. Subject to these and other exceptions ordered by Government from time to time, the P. W. D. has the responsibility to maintain all Government buildings. Maintenance includes white washing, coloring, painting, repairs to doors, windows, roofs, sanitary & water supply fittings, structural repairs, internal roads, fencing, compound walls etc., However, expenditure towards day to day cleaning, sweeping, watch & ward, gardening, payment of rent, water and electricity charges, taxes & tariffs etc. shall be borne by the user department.

2801.1.1. Layout Plans & Building Plans

The Assistant Engineer, in-charge of the section is to maintain correct layout plans of the area with position of roads, buildings, gardens, water supply, electric O/H lines, sewer & w/s lines etc.

Similarly the detailed building plan of the individual building showing plan elevation & section shall also be maintained for record & reference purpose. For any new work in an existing building, as built drawings shall be furnished along with the proposal.

2801.1.2. Protection of Govt. Property

All the properties in-charge of the department like buildings, lands, parks, gardens, grounds etc. are required to be protected from unauthorized encroachments, unauthorized construction, use etc.

2901.1.3. Register of buildings

This is a very important register to be maintained in each Buildings Division of the P.W.D showing therein inventory of all the buildings under its charge, constructed, purchased or acquired by the Govt. irrespective of the manner in which the Govt. funds are allotted for such procurement. The register shall be in the form given in Appendix 2900A. It shows year of construction, cost, use of building, occupant, maintenance cost etc. The number allotted to such buildings in the Register of buildings is displayed prominently in front face on each building. All government buildings shall have a name display board and list of all offices housed there in.

Whenever a new building is completed, the maintenance of which is to be attended by the Building Division, details regarding the building shall be added to the register. Disposal of any building or part by dismantling or sale shall be recoded in the building register. Transfer of control of any building or part of the building from other Divisions or Departments etc. shall be incorporated in the Building Register. Alterations or additions of substantial nature in such buildings shall also be noted. Similarly, if the extent of land surrounding a building is increased or decreased by acquisition, transfer or otherwise, the fact shall be noted in the register. The intention is that the register shall give full and up-to-date information about the buildings under the maintenance charge of every building division. Possession Certificate showing property rights of the land / building shall be obtained from concerned authorities and maintained in proper order.

2801.1.3.1. Inventory in the Buildings

An inventory of all the fixtures in each building viz. electrical fixtures, like fans, lights, geysers, Air-conditioner or Civil fixtures like mirrors, basins, taps, flushing cisterns etc. and furniture if provided shall be maintained building wise. In case of non-residential buildings such inventory of fixtures is to be got signed from the representative of the user department, at the time of first occupation. Thereafter the user department is responsible for their safety. In case of residential buildings the inventory is to be got signed from each new occupant and checked by the Assistant Engineer concerned when the residence is being vacated. Any shortfall is to be made good by the occupant.

2802. Maintenance of Government Buildings

Designated PWD Civil Engineers and Electrical Engineers under the control of each Government building shall be responsible for its upkeep and maintenance. All maintenance and construction shall be done under their supervision and direction. Other quasi government agencies or private agencies shall not carry out any modification, minor or major works in such government buildings.

2802.1. Fixing of maintenance grant

Each building or group of buildings in one campus forming one administrative unit shall have an annual maintenance grant fixed by the Chief Engineer (Buildings). This grant is intended to meet the, cost of ordinary repairs such as petty repairs to walls floors, doors and windows, roof etc., white washing, painting etc. which are of a recurring nature. This grant shall be fixed on the basis of a standard estimate for its ordinary repairs. Annual cost shall include proportionate amounts for items like painting. The grant also includes cost of maintenance of water supply, sanitary installations and electric installations.

Divisional Officers will program the works in the Divisions suitably under the various sub heads of account and forward them to the Chief Engineer before 15th November every year for incorporating in the budget for the coming financial year. Total budget provision is allotted by Chief Engineer (Buildings) amongst the divisions under the different sub heads in April of every year and the Divisional Officers shall plan their programs within the funds so allotted.

Maintenance of buildings shall be taken up-as soon as the monsoon is over and all items according to the sanctioned estimate carried out. If changes are required in the approved estimate for any

reason it shall be effected before according sanction to the estimate. On no account shall the limits set out for carrying out the repairs exceeded.

The fixing of grant for ordinary repairs subject to the conditions laid down above shall be approved by the Chief Engineer, Buildings and recorded in the register for typical maintenance estimate kept in that office. The approval and copy of sanctioned estimate shall be forwarded to the Executive Engineer Building Division concerned for recording. In any particular case where the grant of 2% will not meet the needs of the situation, sanction of the Government shall be obtained for the fixation of the grant.

In some cases requiring expenditure by way of labour charges may have to be met from the maintenance, as for instance, wages of staff appointed to look after rest houses, or staff for operation of water supply scheme to colonies, cleaning of toilets and urinals in the office complex etc. The amount required for such engagement of workers may be considered as over and above the 2% ceiling fixed for ordinary maintenance grant. The nature of workers to be employed, the number and the grades of persons shall however be got sanctioned by Government as per rules in force.

In the case of certain classes of buildings like Tourist Bungalows, Rest Houses etc. Linen curtains, crockery etc. originally provided at Government cost and responsibility for renewal is with the P. W. D, shall be dealt with as part of special repair. The cost on account of these need not be included as part of the ordinary maintenance grant of the concerned building. In all other cases such charges shall not be incurred by the P.W.D. except under special orders of Government.

The grant fixed for ordinary repairs for every building shall be revised once in every five years or as often as found necessary. In all cases where the existing grant is altered, the alteration shall be on the basis of the standard estimate and the then current schedule of rates. The ceiling of 2% of capital cost will not apply in such cases. Revisions shall also be noted in the typical maintenance register.

Maintenance grant do not include expenditure. Like - a) Municipal taxes, b) Service charges, c) Water charges, d) Telephone, e) Electricity, f) Internal roads etc.

2802.2. Periodicity of certain items of ordinary repairs

White washing in Government buildings shall be carried out once every year. One coat will normally suffice.

Distemper washing when provided shall normally be carried out once every two years. Here also one coat will suffice. However, in buildings where distemper washing is badly soiled, the bottom portion of the wall for a height of 2 meters may be distempered with one coat even in years when the full distemping is not done.

Water proof colored cement washing like snowcem etc. need be redone only once in 2 years. The renewal need be of only one coat. If fungus or moss growth is observed here and there, such portions may be cleaned and touched up with the waterproof cement wash of the same color (snowcem etc.). Ordinary cement washing wherever provided may be redone every year.

Painting of walls, woodwork and doors and windows is to be normally redone once every two years. As an exception to the above painting of walls etc. in the case of laboratories, hospitals, such other buildings as are considered by the Executive Engineer to require special treatment may be carried out once every year. One coat of paint will do in all cases except where the old paint has peeled of or has shown blisters. In such cases the old paint has to be completely scraped and two coats of new paint applied.

Painting of iron work including fittings and fastenings in doors, windows etc. shall be redone once every year with one coat. Where the existing paint is damaged and rust or corrosion is seen, the particular area shall be thoroughly cleaned of all old paint and two coats of paint one base coat and one final coat shall be applied. Particular attention to this aspect is necessary in respect of buildings within half a mile of the seashore where ironwork is subjected to severe corrosion.

Galvanized iron work as in pipes, or G.I. sheets etc. need not be painted for the first 2 years. Thereafter because of gradual wearing out due to abrasion etc., the protection afforded by galvanization gradually wears out and hence after the first two years such items may also be included along with ironwork for painting purposes.

Varnishing and wood oiling are to be redone once in two year with one coat.

Wherever there are thatched roofs, re-thatching shall be done normally once every year with one old and one new cadjan leaf.

In case of prestigious buildings declared as such by the Chief Engineer, the Chief Engineer concerned will issue special instructions regarding periodicity and items of maintenance work to be carried out.

2802.3. Special repairs

These refer to repairs which are not periodic or frequent e.g.-rebuilding of a damaged wall, re-roofing a building, renewal of flooring etc. Although funds for such special repairs are allotted from the grant under maintenance, such works shall be treated generally as original works and shall be arranged only after the estimate is sanctioned and funds are specifically allotted for the purpose. In other words special repairs shall not be started anticipating sanction to estimate and funds except in emergent cases when certain works may have to be carried out in the interest of safety of life and or property. Officers sanctioning special repairs estimates must take care to see-

(a) That the works do not involve substantial additions or alterations. Petty items costing not more than Rs. 3 lakhs in respect of any building other than residential buildings may be carried out as special repairs even though they may be of an original nature. Example:- Construction of drains, small retaining walls, enclosing verandas etc.

In respect of residential buildings the cost of original works, if any carried out, as special repair work shall not exceed Rs 3 lakhs or 2% of the value of the building whichever is less;

(b) That the standards prescribed for the class of buildings are not increased.

(c) That the estimate does not include items which shall be provided by the occupant or occupying department

(d) That the works include major repairs, which strengthens the building, prolongs, its life, improves its hygienic condition & safety of the building.

2803.Responsibility of the occupant or occupying department

It is the responsibility of the occupant or occupying department to attend to the following works in regard to the building and premises under its occupation.

- i. Sweep and keep the building and premises clean.
- ii. Remove cobwebs and white ants as and when they are detected.
- iii. Remove rubbish and silt from drains and grit chambers if any, and keep them clean.
- iv. Keep the sanitary fittings cleaned up.
- v. Replace electric bulbs and tube lights when they get fused, cleaning electrical installations like fans, tubes, air-conditioner and inverters and filling distilled water in batteries, radiator coolant and topping up of diesel to generators.
- vi. Arrange watch and ward.
- vii. Arrange lease of usufructs of trees in the premises and dispose decayed, dangerous or unwanted trees (applicable only to occupying departments).
- viii. Maintain garden, if any.
- ix. Maintain furniture.
 - x. Keep overhead tanks, if any, cleaned up periodically.
- xi. See that the structure is not damaged in any way, as for instance by heavy furniture being dragged on the floor.
- xii. Deal direct with the electric supply authorities in regard to payment of bills, and in regard to complaints regarding service.
- xiii. Deal direct with the authority controlling the public water supply system supplying water to the building in regard to payment for water charges and complaints regarding service.
- xiv. Deal direct with the authority controlling the public sewerage system serving the building, regarding payment of bills and complaints regarding service.
 - xv. Deal direct with the Local Bodies regarding payment of property tax.
 - xvi. Request the Public Works Department for any maintenance/additional works
 - xvii. Deal directly with concerned authorities for payment of telephone and internet charges.
 - xviii. Deal directly with concerned authorities for payment of land tax, other levies etc.

Further, the occupant or occupying department shall not make any structural alterations or put up additional structures, or dismantle any portion of the building. Such construction work, if required shall be done by the Building wing of PWD, who is responsible for the safety and maintenance of the building. The Electrical wing of PWD shall attend to any alterations to the electric circuits.

In case any damage in the structure or the internal electrification or water supply or sanitary installation is noticed the same shall forthwith be intimated by the occupant or occupying departments to the concerned PWD officers for necessary action. On receipt of any such complaint it is the responsibility of the P.W.D. officers concerned to arrange to inspect the building and rectify the damage as early as possible. If such rectification is likely to take time the fact shall be intimated to the occupant or occupying department and where possible, necessary temporary arrangements may be made to enable the building being occupied and put to use before permanent rectification is done. Such temporary arrangements shall be treated as special repairs.

2804. Inspection

It is essential that buildings under the maintenance of the P.W.D. are periodically inspected so that damage, if any noted, is attended to then and there and not allowed to cause deterioration of the structure. The Assistant Engineer shall inspect all the buildings (whose maintenance is under his/her charge).

- a. At least once before preparation of estimate for annual repairs.
- b. As often as is necessary for quality control during the execution of repair work.
- c. As often as is necessary for measurements and for accompanying superior officer for check measurement.
- d. When the occupying department points out damage if any.

The Assistant Executive Engineer shall inspect all buildings under his maintenance charge as often as possible for quality control of maintenance works and for check measurement. Further, where the annual maintenance grant is over and above the TS powers of Assistant Engineer, he shall also inspect the building before sanctioning the maintenance estimate.

The Executive Engineer shall inspect once every year all the major buildings under his maintenance charge where the annual maintenance grant is over and above the TS powers of Assistant Executive Engineer. He shall also inspect once in a year at least 50% of the other buildings under his charge.

Inspections shall be purposeful. Attention shall be particularly directed to the following:-

- i. Whether any wall is cracked or is bulged or is thrown out of plump.
- ii. Whether doors and windows close and open properly and have all their fastenings and fittings.
- iii. Whether the drainage from the bathroom is satisfactory.
- iv. Whether the general drainage is satisfactory.
- v. Whether there is any subsidence or crack in floor.
- vi. Whether there is seepage of water and consequent damages in walls and floors.
- vii. Whether the compound wall and fencing, gate etc. are in good condition.
- viii. Whether woodwork particularly in doors show signs of decay or rot.
- ix. Whether there are leakages.
- x. Whether the floors of open terraces are properly sloped towards outlets and whether the down water pipes are intact and clear.
- xi. Whether the valley sheets are in good condition.
- xii. Whether the yard is clear of jungle growth and unwanted vegetation
- xiii. Whether any vegetation growth observed on walls or roofs.
- xiv. Whether the sanitary installation is satisfactory.
- xv. Whether water supply installation is satisfactory.
- xvi. Whether the electrical installations such as lifts, air conditioners etc. are functioning satisfactorily

Note: The examination of the electrical installation shall be got done by the concerned officers of Electrical Wing of the P.W.D.

2804.1. Maintenance of Heritage Structures

Buildings maintained by PWD also include many heritage structures of prestigious nature. While attending to repairs of such buildings it shall be ensured that the original characteristics and aesthetics of these structures are preserved.

2804.2. Repairs of Emergency nature

Certain items of repairs of emergency nature such as dampness, leakages in roofs and walls, water percolation through water supply and sanitary installations, damaged stairways etc. shall be attended to immediately by the concerned Assistant Engineer under intimation to the immediate superior officers.

2804.3. Cracks in Buildings

Cracks if any noticed in any part of the building needs to be investigated thoroughly and cause ascertained before taking remedial measures.

2804.4. Calendar for Maintenance of buildings

The work of maintenance of building shall be so programmed as to cause least inconvenience to the occupants. As far as possible, special repair, if any, shall be carried out along with ordinary repairs. Work shall be started only after all the requisite materials are available and completed within the shortest time possible. Suitable penalties shall be prescribed for delays in executing contract agreements and completion for maintenance works.

In the case of vacation departments like Schools, Colleges, Courts etc., the maintenance works shall be carried out during the vacation period (generally April and May) unless such vacation period happens to be the monsoon season.

In the case of buildings other than those of vacation departments and buildings of such vacation departments as have the vacation in monsoon period; the maintenance work shall be done in the dry weather between December and February.

For buildings whose maintenance work has to be carried out between April and May, tenders shall be invited and finalized even before the commencement of the new financial year so that work can be started as early as possible in April.

Tenders for the maintenance of other buildings shall be invited and finalized well before December every year.

Since the buildings will be under occupation, the actual period when maintenance works are to be done shall be settled in consultation with the authorities of occupying department.

2805. Funds

Funds required for maintenance of buildings under the control of any Division during any financial year will be made up of-

- i. Amount for ordinary repairs as per sanctioned grants for the several buildings.
- ii. Amount for payment or dues on account of carry over portion if any of special repairs works of the preceding year or years.
- iii. Amount for payment or dues on account of carry over portion if any of Ordinary repairs works of the preceding year or years.
- iv. Amount for payment of such portion of staff charges as is directly debitable to maintenance and not included under establishment charges.
- v. Amount required to meeting emergent and unforeseen items of repairs.
- vi. Amount required to carrying out new special repair works during the current year.

Out of the above, items (i) to (iv) are more or less in the nature of inevitable expenditure and shall, therefore, have a prior claim on the funds allotted for maintenance of buildings. Item (v) is a provision for emergencies and a reasonable forecast shall be made based on past experience and a L.S. amount reserved for this. The L.S. amounts shall be retained by the Chief Engineer and distributed suitably. Item (vi) shall be based upon rough estimated cost of the works proposed to be taken up in a Division.

The Executive Engineer when moving for funds under this item shall also list the works in the order of priority. If the total funds allotted falls short of the requirement some works of lower priority shall be dropped out and these may be accorded higher priority next year. As far as possible special repairs shall be completed and paid during the year itself but if this is not possible, it is permissible to carry over the work to the next year. The number of works to be taken up from out of the available grant shall be so fixed that it is possible to make payment for all works completed during the year.

2805.1. Sanctioning Authority

No administrative sanction is required to carry out maintenance works. The officer of the P.W.D. may accord technical sanction but the following condition shall be satisfied before according technical sanction.

(a) In the case of ordinary repairs, the amount of the estimate shall not exceed the maintenance grant sanctioned. If due to special circumstances, the estimate cannot be limited to the grant, approval of the Chief Engineer shall be obtained for the increased amount.

(C) In the case of maintenance and repairs of electrical works, the technical sanction is to be accorded by the Executive Engineer (Electrical) up to a maximum of Rs. 25,000. When the amount exceeds Rs. 25,000 (in respect of electrical works) technical sanction will be accorded by the Chief Engineer in consultation with the Superintending Engineer (Electrical).

(d) In the case of emergent works charged to maintenance, the technical sanction shall be accorded by an officer not below the rank of an Executive Engineer.

2806. Arrangement of contracts for maintenance works

It is preferable to arrange contracts for maintenance works on the basis of percentage rate contracts.

The quality of materials, paint etc. to be used in maintenance works shall be clearly specified in the tender documents. This is because there is a wide range of quality of paints etc. available in the market and it is essential that the quality of the material to be used shall be understood by the tender. During execution the departmental subordinates shall ensure that the proper quality of materials, paint etc. as provided in the contract has been used.

In all contracts for maintenance works there shall be a condition that the contractor shall carry out the work without causing hindrance or disturbance to the occupants of the building. If during the course of the work, the floor or walls or other portions of the structure under use are spoiled by debris, spots of paint, white wash etc. such portions shall be cleaned up then and there without waiting for the whole work to be completed. This is in addition to the contractor's responsibility for removal of debris on completion of work.

2806.1. Use of standard measurement

It is very desirable that standard measurement books containing detailed measurements of various items of ordinary repair of major buildings are maintained as prescribed in Para 10.2.12 and 10.2.13 of the K.P.W.A. Code. This will considerably lighten the work of measurements of maintenance works year after year.

2807. Rest Houses

The Assistant Engineer shall see that as far as possible the rest houses are not occupied without valid reservations. Rules for the reservation, occupation, etc of travelers' bungalows, rest houses, inspection bungalow, camp shed etc., under the control of PWD are given as Appendix 2900B

2807.1. Inventory of Furniture, Crockery & Fixtures of Rest Houses

The Rest Houses requires both perishable, non perishable items & consumables for its running. Therefore, purchases as per requirement shall be done and taken on record promptly. Items get unserviceable in due course which shall be properly surveyed and survey report prepared for further inspection and sanction from the competent authority. These materials shall then be destroyed/ disposed and written off from the record as per procedure.

2807.2. Proper upkeep & Cleanliness

Rest Houses shall be kept clean, neat and tidy at all times. All the rooms, dinning hall, kitchen, verandahs, work area should be neat. Furniture, carpets, drapery shall be cleaned periodically. Bed sheets, towels, utensils shall be properly washed and cleaned. The toilets, bathrooms and wash basins are to be cleaned and kept odorless. Proper arrangements for water in toilets, bathrooms and wash basins shall be provided. The staff is to be properly dressed and their behavior shall be gentle and courteous.

2807.3. Misuse of Rest Houses

The Assistant Engineer of the Building Section shall be responsible for the proper use of Rest Houses. He shall avoid unauthorized occupation and use of Rest Houses. Holding meetings, arranging lunches, marriage functions, ceremonies etc. in the R.H premises, shall not be allowed without prior permission of the Executive Engineer of Building Division.

2808. Allocation of Quarters

The Government employees can be allotted Government accommodation on availability. The District Collector as per rules given as **Appendix 2800C** issues the allotment of the quarters other than PWD quarters. The employer to whom quarter has been assigned shall execute agreement as per **Appendix 2800D** with concerned Assistant Engineer (Buildings) with an advance payment equal to an amount of two months' rent. The copy of the agreement shall be forwarded to the Executive Engineer under intimation to the Assistant Executive Engineer.

A full list of furniture, fittings and equipments like Electric items, Water supply fittings, Ammikal, Attukal, locks, keys etc. of each residential building shall be maintained by the Assistant Engineer under the control of the maintenance of the building. When the building is handed over for occupation, the occupant shall sign and acknowledge the various items included in the inventory as per **Appendix 2800E**. When the occupant vacates the house he shall give prior intimation to the Assistant Engineer and handover all the items in the inventory list as well as any additional items subsequently fitted, in good condition. The occupant shall also produce necessary no due certificates from the Kerala Water Authority, KSEB etc. at the time of handing over the quarters. The Assistant engineer shall intimate the vacancy of the quarters to the Executive Engineer on the same day when the occupant handover the key.

2809. Miscellaneous Provisions**2809.1. General**

All major public buildings and government quarters shall have provision for waste disposal. Solid wastes shall be disposed in an incinerator. Non-biodegradable waste materials shall be, segregated and suitably disposed.

Public buildings shall be provided with sufficient urinals and latrines, as per norms and shall be properly maintained. Their location must be clearly exhibited with name boards.

Electrical installations such as lifts, escalators, AC etc. shall be periodically inspected and maintenance arranged as per specification of the manufacturer. Backup electric power shall be provided for such installations with staff posted for operation.

2809.2. Furniture

The responsibility for providing furniture in any public building shall be that of the occupying department. In the case of Rest Houses and Tourist Bungalows under the Control of P.W.D., the supply of furniture cutlery, crockery, linen etc., shall be provided by the P.W.D. and the same shall be charged to the estimate for the construction of the building.

2809.3. Fire Fighting Systems

The occupying department shall render all assistance for renewals and repairs of the fire fighting system, if any, if sought from the Fire Force Department.

2809.4. Advertisement/ Display boards

All display boards in government property shall comply with the provisions of part 10 section 2 of National Building Code. All advertisement/ display boards utilizing Government/PWD building, land and compound wall shall require permit from the concerned Executive Engineer, buildings, which shall collect the prescribed fees and remit it directly to the KERALA ROAD FUND BOARD. This amount shall be released for any maintenance of buildings on request of concerned Executive Engineer.

2809.5. Fixing of Rent for Building

When government buildings are not available it may be necessary to hire private buildings for government purpose. The officers of the administrative department will locate suitable buildings, get the consent from the owner and furnish a copy of same along with a certificate that no other private building at a lesser rate of rent is available shall be forwarded to the Assistant Executive Engineer, Buildings, Sub

Division of the locality. The Assistant Executive Engineer will then issue a certificate that no government building in his charge is available in the locality for the purpose. The administrative department will then decide to take the building on rent.

The Executive Engineer, Buildings Division will act as the Estate Officer of all government buildings.

Once the building is decided to be taken on rent the head of the occupying office will forward the following documents to the Assistant Engineer Buildings Section of the locality for fixing rent of the building.

- 1) Consent document in original with dated countersignature.
- 2) Land value certificate indicating the market value of land on the date of occupation/proposed date occupation issued by the Thasildar.
- 3) Age certificate of the building issued by the local authority.
- 4) A list of officers and staff of the office with a note on special request of space if any.
- 5) The prescribed proforma duly filled up and signed.

The Assistant Engineer is responsible for taking exact measurements and working out rent as per the guidelines prescribed in the specific proforma **Appendix 2800F**. The construction material, construction method etc. shall be properly verified on site and the rent worked out. The Assistant Engineer shall prepare the rent calculation on the basis of **clause 2809.5 and** approve the same and issue rent certificate if the rent calculated is within his powers of sanction and if not forward it to the superior officer to approve the rent calculation as per delegation of powers.

The rent calculation and processing shall be completed within 20 days in the section office and 10 days in each higher office. The competent authority of the occupying department, who shall get the administrative sanction from the competent authority of their department and pay the rent from their funds, shall forward the rent certificate. On receipt of the administrative sanction the concerned officer of the occupying department shall execute a lease deed with the owner of the building in the form given in **Appendix 2800G** and pay the rent to the parties from the date of occupation or date of agreement whichever is earlier. The occupying department or the occupant shall pay the electricity and water charges for the building during the period of occupation. Once a building is occupied and rent fixed for the same, revision of rent will be permissible only after the expiry of a period of 3 years from the date of agreement or date of occupation whichever is earlier. Any revision of rent shall be made only on specific request from the owner of the building and shall be effective only from the date mentioned above or from the date of application for revision of rent whichever is later. Notwithstanding the above if any alterations or additions are made to the rented building by the owner at the request of the occupying department rent may be revised to allow for the above alteration or additions from the date of completion of the same.

If the rent demanded by the owner is higher than the P.W.D. rate of rent the same has to be treated as special rent. In case of special rent approval of the Government Rent Committee constituted for this purpose shall be obtained before the administrative department passes orders. Government will fix the procedure for this from time to time through technical circulars or orders. If special rent is sanctioned the same shall be valid for five years and the owner can demand revision only after this period. The lease deed shall be executed specifying this period

2809.6. Rent Calculation

The capital cost of a building at current rates as per technical circular of the Chief Engineer from time to time will be calculated and depreciated capital cost worked out at the rate provided as detailed under **clause 2810.2.1**. The cost of actual land limited to 3 times of the plinth area of the main building and 1½ times that of the outhouse will also be calculated at the rate as per the land value certificate issued by the Thasildar. This will be added to the depreciated cost of the building to arrive at the total capital cost. 6 % (Six Percent) of the capital cost will be taken as the annual rent. It shall be the responsibility of the owner to do the maintenance work as also to pay the taxes due to the building and premises. The details of rent calculation for partially occupied building etc., will be worked out based on the technical circular issued by the Chief Engineer from time to time.

2810. Valuation

2810.1. Valuation of Building

First a detailed plan and specifications of the items of work in the structure shall be prepared. It is likely that certain details like mortar proportions or quantity of steel used in R. C. work cannot be found out by usual observation. In such cases assumption may be made that the mortar or concrete of the type used contains the minimum proportion of cement material, which will be required for the stability of the concerned portion of the structure. Similarly in R. C. work, in the absence of any other data, the minimum of steel necessary for the particular item may be assumed as having been used. With regard to foundations a few examination pits shall be taken to find out depth and nature of foundations.

2810.2. Cost Estimation

An estimate shall be prepared for the construction of the structure using the current PWD schedule of rates. Where non-standard items of work are done, special data for the same shall be worked out on the basis of prevailing market rates. In case the building is electrified, the estimated cost of electrification shall be worked out in consultation with the Assistant Engineer, Electrical Wing of PWD. For leveling site, only the minimum quantity necessary for construction of a building of the size shall be assumed unless there is evidence at site that extra quantity of work was involved and it is possible to measure such extra quantity. Leads and lifts for materials shall be worked out as if the structure is being constructed by the department at that site. If any item of work done is sub-standard as compared to the same item as per P. W. D. specifications, suitable percentage reduction may be made for the same. Similarly, if any item of work is of especially superior standard as compared with the corresponding item of P. W. D specification, a suitable extra percent on the rate of the concerned item due to such superior work may be allowed.

2810.2.1. Depreciation

From the estimated cost of the building worked out on the above basis, depreciation shall be deducted for the period, which had elapsed after the building was constructed. The age of the building shall be ascertained by local enquiries including enquiries from local bodies like Municipalities, etc., having jurisdiction over the area. The facts ascertained through such local enquiries shall also be verified by examination of the condition of the building and its component parts.

Depreciation is effected from the estimated capital value worked out and above. The depreciation is applied successively for each year, i.e., by compounding the depreciation annually. The depreciation constant for calculation is given in [Table 2800.1](#)

Table 2800.1 Depreciation Constant

Extract of G.O. (Ms.) No. 9-538/54/C.S., dated 16th May 1956 to the Chief Engineer, P.W.D., Trivandrum

<i>Depreciation Constant</i>									
<i>Year</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>Year</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
	1.0%	1.5%	2.0%	4.0%		1.0%	1.5%	2.0%	4.0%
1	.9000	.9000	.9000	.9000	16	.8504	.7841	.7231	.5210
2	.9000	.9000	.9000	.9000	17	.8418	.7723	.7086	.5001
3	.9000	.9000	.9000	.8849	18	.8333	.7607	.6944	.4801
4	.9000	.9000	.9000	.8496	19	.8249	.7492	.6805	.4610
5	.9000	.9000	.9000	.8156	20	.8166	.7379	.6668	.4426
6	.9000	.9000	.8855	.7830	21	.8083	.7267	.6534	.4249
7	.9000	.8991	.8678	.7518	22	.8002	.7158	.6403	.4080
8	.9000	.8855	.8504	.7218	23	.7921	.7050	.6275	.3916
9	.9000	.8722	.8333	.6929	24	.7841	.6944	.6149	.3760
10	.9000	.8590	.8166	.6633	25	.7762	.6839	.6026	.3610
11	.8945	.8451	.8002	.6387	26	.7685	.6736	.5905	.3465
12	.8855	.8333	.7841	.6132	27	.7607	.6634	.5786	.3328
13	.8766	.8203	.7685	.5887	28	.7530	.6534	.5670	.3195
14	.8678	.8083	.7530	.5652	29	.7454	.6436	.5556	.3067
15	.8590	.7962	.7379	.5426	30	.7379	.6339	.5445	.2944

The description of various categories of building are given in the table below

Type	Description
A	Buildings with brick or stone masonry in lime or cement mortar with R.C.C. or tiled roof over good quality Teak of wood and R.C.C. framed structure
B	Building with brick or stone masonry in mud mortar or laterite in lime mortar with tiled, A.C. or G.I. sheet roofing over country wood or steel.
C	Buildings with sundried brick or laterite in mud mortar with country wood over tiled, A.C. or G.I. roofing
D	Buildings with mud walls, and thatched roof over country wood or bamboo rafters etc. And Temporary sheds thatched buildings of inferior type construction.

The depreciation for electrical installation shall be 6% and that of water supply and sanitary fittings shall be 4%.

In addition to normal depreciation, deductions shall be made for damages in any point of the structure. When allowing normal depreciation rates, it is expected that the structure is maintained properly. Hence depreciation does not cover special damages such as cracked walls, damaged roof, rotten state of wood work etc. A reasonable amount, which may be more or less equal to the cost of rectification, shall be deducted from the depreciated value of the building to arrive at the final cost to be intimated to the revenue authorities.

Powers of the officers of the P.W.D. regarding valuation of buildings shall be as per delegation of powers given in section 200. The maximum time that can be allowed for completing such valuation in the section office shall be 30 days.

In all cases of valuation of buildings, the Assistant Engineer concerned shall make the preparation of the plan, specifications and estimate. Where the valuation has to be approved by officers higher in rank than Assistant Engineer sufficient time (15 days in each of the higher offices) shall be allowed. Before the valuation is approved it is imperative that the officer who is competent to approve the valuation shall inspect the structure with the plan and estimate and satisfy himself about the various provisions made therein.

2811. Lease of Government Property/ Buildings

The government may provide its land or buildings on lease for public use to other agencies like bank/ societies/ public undertakings etc. for a specific period on remittance of monthly rent. The Government and the lessee shall enter into an agreement as per **Appendix 2800H**. Under no circumstances government land or building shall be leased free of cost. Chief Engineer Buildings shall fix a reasonable rent and the agreement executed.

SECTION 2900

2900. Maintenance –Movable Assets

2900.1. General

This chapter includes the maintenance of articles, which are necessary for carrying out the various works of the Department. It includes items like vehicles, office accessories like furniture and communication systems, survey instruments and other tools and plants, reference books and codes, appliances, etc., which are not consumed in the course of execution of works. This invariably includes the replacement/procurement of obsolete/requisite items also. This chapter also includes materials and other stores that get consumed in due course.

Most of the works in the P. W. D. are carried out through contract agencies and the selected contractor is to supply all the materials required for the complete work, including special items as in the case of projects. However, for departmental execution, supply of certain materials for the construction is necessary and these shall be procured as per section **2909**.

Projects under departmental execution may require a number of special items to be procured and stocked particularly tools and plants and their spares and accessories. In such cases, the list of items to be stocked shall be prepared by the officer under the control of the project and the approval of the concerned Chief Engineer obtained. Such projects shall have its own store to cater to the needs of the project.

In the case of completed projects with special tools & plants charged to the project, these shall be disposed off in public auction after obtaining sanction for the survey report of the articles.

tools and plants shall be grouped under the following heads prescribed in the list of Major and Minor heads of account with sub-groups wherever necessary.

- (a) Scientific and drawing materials
- (b) Tools, Plants and Machinery

2901. Registers

A Register of movable assets in the form given in **Appendix 2900A** shall be maintained in each office. Every item acquired by purchase, transfer or through any other way shall be included in the appropriate groups in the register kept in the concerned Division Office. Similarly every item, which is disposed of finally by transfer to other divisions or by sale or in any other manner shall be noted in the appropriate register. Each division will have an up to date register of all the assets like vehicles, office furniture, survey instruments and other tools and plants, reference books and codes, all appliances and spares including those in subordinate offices grouped under proper heads as above.

To ensure that all acquisitions and final disposals are posted in the register, the vouchers dealing with the acquisition or final disposal shall contain a certificate from the Accountant under the control of work in the division that the transactions have been posted in the Register giving also the page and item number of the entry. The certificate shall be checked and initialed by the Divisional Accountant after verifying the concerned register.

Cases may arise where the transactions regarding acquisitions or final disposal are dealt in the subdivision office. Before the concerned vouchers or other documents dealing with these are finally accepted, the same shall be got pre-checked and passed by the Executive Engineer so that appropriate entries are made in the register of the division.

Each item of tools and plants, scientific and mathematical instruments and furniture shall be given an identification number when first received in the division and this number shall be quoted in all transactions relating to the same. The identification numbers will be preceded by an initial representing the name of the Division and followed by initials representing the group and sub group to which the item belongs. The number itself will be based on the serial number of the item in its subgroup or groups in the concerned register.

Spares shall also be entered in the register as per Appendix 2900A and treated as stock items and when used for replacement or in repairs shall be shown as issue on the register and concerned repair estimate. Accessories however are additional equipments to improve its performance. If these are kept separate, these shall be numbered and accounted in the register. If fitted, the accessory need not be separately accounted but the descriptions of the Plants shall indicate the fact of the accessory being fitted in it.

All movements of tools and plants, scientific instruments etc., which are given separate identification numbers shall be watched through a movement register so that at any time the location of any item is easily known. The form in which movements shall be recorded is given in Appendix 2900B. To enable the movement register kept in the Division Office being posted up-to-date, all movements of such Tools and Plants shall be accompanied by a transfer note in form vide Appendix 2900C a copy of which shall be sent to the Division Office.

2902. Classification of Stores.

For easy identification, docketing and control, each item to be stored shall be suitably grouped/classified under different trade groups and given a permanent identifying number by the Executive Engineer. All the transactions shall indicate the code identification number and the measurement of each item shall be in standard units only. The variation, if any, between the quantities entered in the store accounts and the quantity computed from the suppliers bill shall be adjusted in the account then and there.

2903. Estimating the Requirements

Requirements vary with the nature of work. If additional instruments are required, as in the case of special investigation work or in project work, the sanction of competent authority shall be obtained for procuring the same.

In the case of Divisions, Subdivisions and Sections the annual requirement must be prepared by the Executive Engineer based on the shortage arising either from inadequate supply originally or from some of the available instruments being in disorder. In the latter case, before arranging for fresh supplies in lieu of instruments in disorder, an examination must be made whether the same can be repaired at reasonable cost. Repairs shall be done at the Government approved workshop.

Where electronic or other sophisticated equipments are required, estimate shall also include the necessary cost for annual maintenance contract if the manufacturer has such provision.

2904. Instruments

Regarding, mathematical and drawing instruments each Draftsman, Overseer, Tracer and Assistant Engineer shall have one set of drawing instruments consisting of-

- (a) One Mathematical Instrument Box
- (b) One tee square/ Mini drafter
- (c) Two set squares
- (d) One parallel ruler
- (e) Box of scales including plotting scales and architectural scales.

In addition in each Division Office there shall be one set of French curves, Pantograph and Planimeter and computers with drafting software's like AutoCAD and a printer/ plotter. If in any Division, Subdivision, or Section the normal standard as specified above is found inadequate then additional instruments and/or Superintending Engineer or Chief Engineer may sanction additional quantities of the listed items according to necessity.

2905. Tools and Plants

Tools and plants required for the general use of the department will be held as part of stock and will be accounted for as such. The Executive Engineer shall annually review the existing stock of the Tools and Plants available in the Division.

Existing hand tools like matts, pickaxes, shovels etc. not in use shall be accounted and survey report prepared. These shall be disposed off in public auction after getting sanction to the survey reports from the competent officer.

Machinery required for works done by contractor shall be provided by the contractor himself and shall not be provided by the department on hire. The department shall hire all machinery required for departmental execution of works.

Existing road rollers, bitumen rollers asphalt hot mix plants, sprayers and accessories of the above for road surfacing work, which are not in use, shall be accounted and survey reports prepared. These shall be disposed off in public auction after obtaining sanction from the competent authority

2906. Departmental Vehicles

Departmental vehicles may broadly be divided into goods vehicles and vehicles for inspection.

Contractors shall provide the goods vehicles necessary for all transport of goods in connection with the execution of the contract. Hence all the departmental goods vehicles shall be accounted and survey report prepared. These shall be disposed off in public auction after the competent officer sanctions the survey report. If there occurs a need for goods vehicle, it shall be hired by the department.

For inspection work officers are expected to use their own conveyances for which they are entitled to get T. A. as per rules. However, it is necessary that some Departmental vehicles are also available for inspection and for use as a staff car. The number of such staff cars shall be kept to a minimum, with each Division being given one car and each subdivision one jeep or a car. Where the vehicles provided are inadequate, sanction of Government shall be obtained for the additional vehicles.

Wherever vans are available and are in use this may be considered against the provision for jeep.

In addition to the above there will be one car under each Chief Engineer and each Superintending Engineer and the Chief Architect to serve as staff car. Mobile Laboratory shall be provided for the KHRI and a Mini Bus under Human resources for Training.

In some cases as in projects, it may be necessary to provide special facilities by way of school bus, ambulance etc. These shall be considered as special requirements and shall be provided only with sanction of Government.

Vehicles may be taken on hire with the approval of concerned Chief Engineer, if department vehicles are not provided.

2907. Office Accessories- Furniture, Communication Systems.

All the offices of PWD shall have the necessary means of communication service for improving the performance. Telephone and photocopiers, Computers, printers etc shall be provided to all the offices of PWD. In addition Chief Engineers shall also be provided with laptop. Offices of Executive Engineer and above shall have fax. In addition, concerned Chief Engineer shall sanction Fax facility to other offices as per requirement. All officers of and above the rank Assistant Executive Engineer are provided with email facility and communications may be sent as email also.

Apart from the existing postal delivery system, modern communication facilities such as, email and web connectivity, couriers etc. may also be suitably used. Mobile phones, call conference, video conference, shall be made available as per requirement.

All PWD offices shall have necessary tables, chairs, stools, racks/ shelves, almarah and cash chest as per Government rules. Computer tables and chairs shall also be provided.

2908. Bitumen

The Executive Engineer shall procure the bitumen for works up to TS powers of Executive Engineer, from approved sources.

2909. General principles regarding procurement.

For works executed through contractors, the contractor with the exception of clause 130.3 shall do all procurement. The procedures laid down in the Store Purchase Manual shall be followed for all other procurements of the department.

All purchasing officers of the Department when exercising their powers of purchase shall also note the following points.

- a. If any tools & plants and vehicles are required, the concerned Chief Engineer shall sanction a proposal with an estimate for the same. This will form the basis for procurement.
- b. Office accessories like furniture, small tools, survey instruments and reference books and codes shall be procured by an officer not below the rank of an Executive Engineer based on the sanctioned estimate
- c. All purchases shall be against specific provision in sanctioned estimates. As an exception to the above, spares/ replacements may be purchased against L. S. provision provided in the annual maintenance estimate.
- d. The Executive Engineer as per sanction shall procure Scientific and Mathematical instruments, etc. by the competent authority. Special specifications if any shall be clearly indicated in notice inviting tenders.
- e. No unserviceable article shall be accepted/procured.

The procedure to be followed for inviting tenders and arranging purchases will be as detailed in the Store Purchase Manual of Government of Kerala. On receipt of the items, the Executive Engineer shall conduct proper inspection and where necessary test of the equipment and articles received. If required, the help of any Government approved Workshops may be availed for conducting tests and in inspecting the plants, spares and accessories.

2910. Custody and protection of Equipments

Scientific and Mathematical instruments allotted to an office shall be under the custody of a technical officer working in that office subject to the overall control of the Head of the office. Mathematical instruments, and articles like tapes, foot rules etc. may be entrusted to the officers using the above instruments regularly on their personal receipts, subject to the over-all control of the Head of the office.

Plants and Machinery in use will be under the custody of the officer to whom they are issued. Where operators or drivers are employed the operator or driver will be in direct charge of the Plants during the period it is in operation subject to the control of the officer having custody of it. During the period when the Plants are not being operated or where there is no operator for the Plants, the custodian shall arrange for its protection including watch and ward where necessary.

2911. History Book

The custodian of the each and every equipment/ tool/plants/ instruments, etc. shall maintain a history book (Appendix 2900D) that records all the relevant information like registered number, equipment number, date of purchase, model, make, manufacturer, cost of equipment, maintenance schedules, dates of repairs, type of repair, cost of repair, replacements, transfer from Division / offices and any other special remarks.

If any plants or equipment needs repairs, the custodian shall report the fact to the Executive Engineer through his official superior. The custodian shall also arrange a competent mechanic or Engineer/ government approved workshop to inspect the plants and report on the nature of repairs to be done, the time required and the probable cost. If the plants is beyond the stage of economical repair this fact also shall be reported by the inspecting mechanic or Engineer. Executive Engineer may then propose to dispose off the plants at the place where it is or transferred to a suitable place and may then be auctioned as per sanction received from competent authority.

The custodian shall arrange the repairs after getting sanction from the competent Engineer. Where operators or drivers are under the control of a vehicle or plants, they shall notify the custodian immediately of any special requirements or replacements needed for safe functioning of the vehicle or plants.

2912. Use and operation of Tools and Plants

Scientific instruments like levels, theodolites, Total stations etc., shall be handled and used only by technical hands having the requisite training in the use of these instruments. When they are not in use, these instruments shall be kept properly in their boxes or containers. When transported, the boxes or containers shall be carefully supported in cushions without the chance of getting jolted, during the journey. Necessary skilled labour shall be employed for conveyance and carrying out the work.

2912.1. Calibration

Prolonged use may stretch tapes and chains, and the Legal Metrology department as per rules shall do standardization. Measuring and weighing apparatus shall be calibrated at least once in 6 months. Other scientific measuring instruments and lab equipments shall be calibrated periodically as per rules. Calibration and validity certification shall be the responsibility of the custodian.

2912.2. Operation

Operation of plants and machinery shall be entrusted only to operators competent to handle them. For this purpose the required training shall be given to persons selected to work as operators. Such training may be given in special training establishments or by a period of apprenticeship under a skilled operator. Wherever the manufacturers of the equipment issue operating instructions, the same shall be translated to local language and the operator asked to get fully conversant with it. A copy of such operating instructions shall be kept along with the equipment and exhibited in such a manner that the operator can at all times refer to it easily. Where the manufacturers issue no operating instructions, the Assistant Engineer shall write out the important operating instructions for the guidance of operator.

Road vehicles as well as plants that require the operators and crew to have licenses issued by certain statutory authorities shall have Operators who shall possess the required licenses, which shall be periodically renewed and kept current at their own expenses.

All important items of equipment such as vehicles, road rollers, plants, pile driving plants, U compressors, mixers, pumps etc., shall have log books maintained for each such equipment. The log book shall be written by the operator-in-charge of the equipment and frequently checked by the Assistant Engineer, and reviewed by Assistant Executive Engineer concerned. In the case of vehicles, the log book shall be written by the officer in-charge of the vehicle or the officer assigned to use the vehicles.

In the case of plants consuming fuel, lubricants etc., the standard rate of consumption of these per hour of operation or for a certain unit of work done shall be prescribed after carefully watching the performance of each such plants. When reviewing the logbook, a check shall be made whether the actual consumption is reasonable as compared with the prescribed standard. If any abnormality is noticed, the plant's performance shall be tested and if necessary repairs or tuning as are required shall be carried out. The standard of consumption shall be re fixed once a year or as often as found necessary by the Assistant Executive Engineer.

Remittance of Motor vehicle tax, insurance premia, pollution control tests, obtaining vehicle fitness certificate, etc. shall be the responsibility of the operator/ driver and custodian officer.

The rules regulating the use of the staff vehicles maintained in Government offices are reproduced the "Handbook on Rules and Orders for Use Maintenance and Repairs of Government Vehicles" published by PWD mechanical Wing. It also gives the form for Logbook.

2913. Stores

Each store will have a custodian /Assistant Engineer who will be responsible for the verification, receipt, custody and issue of the stock materials and maintenance of initial accounts of all store transactions. The administrative control over such custodians will be exercised by stores officers (Assistant Executive Engineer) who will be stationed in suitable places. The Stores controlling Officer (concerned Executive Engineer) shall render compiled accounts to the Accountant General monthly.

The Stores officers and custodians of Stores shall be provided with ministerial and field staff if required to assist them in the discharge of their duties.

Periodical verification of stores is a matter of great importance and a regular systematic verification of all the stores has to be carried out at least once a year under control of concerned Superintending Engineer.

2913.1. Stationery stores

Stationery items required for each office shall be procured from the government stationery stores. In the case of non-available items, the Head of Office shall arrange the procurement, from open market. The Head of Office shall designate custodian of Stationery store.

2913.2. Receipt of materials

When materials are received in the stores, the custodian shall verify the supply against the order both as regards quantity & quality and against specification. It may sometimes happen that along with serviceable articles, some unserviceable or partly damaged articles are also received, and only the serviceable articles shall be accepted and the unserviceable articles either returned to supplier or temporarily kept in the transit shed till it is disposed of in the manner as settled between the department and the supplier. If any tests are being carried out such tests shall be arranged and the articles shall be accepted and taken into stock only after the tests prove satisfactory. The supplier shall be kept informed of the action taken. The cost of such tests shall be borne by the department unless the order specifies that the test will be at supplier's cost. The accepted quantities shall be entered in the Goods Received Sheet as per **Appendix 2900E**. The custodian of the stores will retain the office copy. The other copies will be sent to the Stores Officer, out of which one copy will be passed on to the supplier. The measurements shall be got checked by the Stores Officer and bill prepared for payment.

Booklets will be serially numbered and the issue and the receipt back of the booklets will be watched through a Register of Goods Received Sheet in **Appendix 2900F**. The used-up sheets shall be arranged in chronological order and bound in volumes of convenient sizes and kept under the safe custody of the Stores Officer.

If the order specifies that supplies shall be completed by a certain date, supplies made after that date shall be accepted only after getting sanction from the authority who ordered supply. Should any correction be effected during check-measurement on a subsequent date, such correction shall be noted in the store records through a plus or minus entry indicating the reason for such entry in the remarks column.

2913.3. Store Accommodation

In the case of departmental execution, the accommodation required shall be assessed based on the expected maximum quantities of materials to be stored at a time. The provision for storage shall be on a

generous scale to avoid deterioration and consequent loss and to facilitate inspection. Covered accommodation shall be provided for all materials that deteriorate due to exposure to weather. Suitable arrangements shall be provided so as to obtain the maximum storage utilizing the minimum building space. Inflammable materials shall be stored separately in compartments not likely to catch fire. Explosives shall be stored only in magazines of approved design with sufficient safety margin all round.

Materials in store shall be properly planned so that supplies received and issues can be traced accurately and care shall be taken to issue out earlier supplies first and later supplies thereafter. (i.e. First in First Out)

The custodian of stores, with the following details, shall maintain an indexed register for different articles.

Type of Material _____

Sl No	Opening Balance	Receipts			Total	Issue			Total	Balance as on date of Issue	Remarks
		Order No.	Date of receipt	Quantities received		Issue No.	Date of Issue	Quantities issued			

This register shall be up to date at all times for verification by higher officers.

The store and the yard around it shall be properly protected with only one gate, controlled by a gateman who shall have a shelter put up near the gate.

2913.4. Issues of articles.

Issues of articles from the stores shall be made only as per issue orders passed by the Stores Officer. The requisition shall contain the name of the work, names of the articles, the code numbers, the unit of measurement, quantities required for the whole work, quantities already obtained and quantities for which requisition is made.

If the articles are to be issued to a contractor, the contractor or his agent/ representative shall produce the Indent (Appendix 2900G) from the Store control Officer who after verification may issue the indent. Simultaneously the Assistant Executive Engineer shall be informed of the number and date of Indent issued against the requisition. At the time of issue, the custodian shall obtain a receipt (Appendix 2900H) from the contractor/ contractor's agent/ representative along with the requisition and the issue shall be intimated to all concerned.

The quantity shall be entered in standard units prescribed for each item either in full or part both in words and in figures. All articles issued shall be counted, measured or weighed as the case may be before they are issued. There shall be proper measuring and weighing apparatus in each store for this purpose. The stores officer shall make it a point to test these measuring and weighing apparatus and keep it accurate.

Counting, measuring or weighing of articles particularly heavy articles may need the assistance of some labour. This shall be legitimately charged to work. Loading of articles into lorry or other conveyance for removal from the store is the responsibility of the custodian of the store. For this purpose the messenger who arrives with the Indent may be allowed to bring in his own labour, lorry or other conveyance to the stores for removal of articles from the store and arrange the loading work.

In the case of issue of stationery items, the custodian shall collect requests for issue and get it sanctioned by the store controlling Officer. Each issue shall be entered in the indexed register shown below then and there and the receiving officer shall sign in the Signature column as a token of receipt.

Name of article _____

Sl No	Opening Balance	Receipts				Issue					Balance as on date of Issue	Remarks	
		Order No.	Date of receipt	Quantities received	Total	Issue No.	Date of Issue	Quantities issued	Issued to	Signature			Total

2914. Hiring of Equipments

The contractor shall provide equipments necessary for a work. PWD shall not hire out any equipment. In the case of departmental execution, PWD shall take such equipments on hire, if necessary, with approval of competent authority.

2915. Repairs and Maintenance

It is essential that all assets be properly maintained so that they can efficiently function whenever required. The maintenance work may be divided into three broad categories, viz.-

- Preventive maintenance
- Periodical overhauls
- Special repairs

Every repair/ replacement shall be duly noted in the logbook and the history book.

2915.1. Preventive maintenance

This consists of carrying out certain item of maintenance as a regular feature so as to reduce the wear and tear of assets. The custodian shall maintain all instruments and equipments accurately and in working condition.

In the case of tools & plants and Department vehicles, regular lubrication, periodical cleaning of oil and fuel filters, tightening of loose joints, etc. shall normally be done by the operating crew when the equipment is in operation. When the equipment is laid off, certain preventive maintenance items may still have to be done occasionally and this shall be arranged through any other suitable approved agency.

Checking and correcting contacts in electrical system and works of a similar nature can be considered as preventive maintenance.

Such preventive maintenance items shall be properly listed out for each equipment and charts of the same written in Malayalam or the language known to the operator and kept with the equipment and displayed whenever it is in operation.

The cost of preventive maintenance works for the above items shall be included in the general maintenance estimate for the division concerned. The Executive Engineer shall arrange such works immediately.

2915.2. Periodical overhauls

This shall be arranged at regular intervals for all items including furniture. The interval may be once every 6 months or once every year or at such periods as decided by the Assistant Engineer. Worn out parts shall be replaced, adjustments shall be effected wherever necessary and painting of such portions as needed shall be done, all as a part of periodical overhaul. The intention is that after every periodical overhaul the equipment is refitted to operate at the maximum efficiency possible consistent with its age and general condition.

If any Plants/ vehicle or equipment has become so old that replacement of worn out parts and refitting will be too costly and commensurate with the efficiency of its performance after the overhaul then it is better that the Plant is disposed off as it is without attending to the repairs. This aspect shall also be borne in mind when taking up periodical overhaul. Mathematical and Scientific Instruments shall be serviced regularly as per manufacturer's instructions and measuring instruments calibrated at the specified intervals as per rules. Electronics equipments like fax, photocopiers, computers etc. shall be serviced regularly. Annual maintenance contracts shall be arranged for electronic and other sophisticated equipments, through agencies approved by manufactures.

The cost of periodical overhauls will depend on the cost of spares replaced, cost of other materials required including oil and fuel, labour involved etc. The Assistant Engineer under the control of the equipment shall prepare the estimate for such periodical overhaul after proper assessment. All such estimates for periodical overhauls to be done during the financial year for the whole division shall be submitted by the 1st week of April, as proposal to the concerned Chief Engineer for approval to arrange the works on time and allotment of funds. The competent authority shall arrange work.

2915.3. Special repairs

These are taken up as and when necessary mostly to repair unforeseen damages to any equipment. With proper preventive maintenance, careful operation, and regular periodical overhauls, the need for special repairs shall arise only very occasionally perhaps due to accidents.

Special repairs can be estimated only after a proper examination of the plant/ equipment is done by competent mechanic or Engineer/ Government approved workshop. The Assistant Engineer shall prepare an estimate based on such assessment including cost of spare and submit for approval from the competent authority. Work may be arranged after sanction is accorded for the estimate. In urgent cases, the Executive Engineer shall arrange work in anticipation of sanction provided funds are available with him to meet the cost.

2916. Workshops

P. W. D. shall make use of the Government approved workshops for all repairs in the case of vehicles and tools and plants. For electronic and other equipments, the authorized service centers of the manufacturer shall be utilized.

2917. Periodical Verification

Periodical verification of all stock items shall cover not only the verification of physical balances, but also the postings and accounts of all transactions, which have taken place since the last verification. The physical balance shall be compared against the account balance after providing for corrections against erroneous entries, if any. Immediate necessary steps shall be taken to deal with excess and shortage. Concurrently appropriate disciplinary action shall be initiated regarding erroneous postings and other irregularities if any detected during verification. An officer designated by the Store Control Officer shall do verification.

2918. Verification of Movable Assets and Store item

Movable Assets shall include Equipments, tools, machinery instruments, computers, vehicles, furniture, books etc. that has to be physically checked and accounted annually. In the case of items in store, the physical balance of item shall be checked periodically and it shall be ensured that there is no transaction of that article (either receipt or issue) until the physical verification of that article is completed.

2918.1.Procedure for Verification

1. The object of verification is not only to ensure that the book balances and the actual physical balances agree but also to see that all the accounts prescribed in the Public Works Department Manual are maintained, strictly in accordance with rules.
2. Before verification of articles actually in the Stores, the verifiers will make a test check of the accounts maintained and satisfy themselves that the book balances are arrived at correctly. This shall be done with reference to the relevant Goods Received Sheets, Indents and the issues.
3. Stock Verifiers will select at random any material for physical check and count all the materials. They shall open the stock ledgers as in the enclosed form (Appendix 2900I) check articles, opening balance and entries for each receipts, and issues and closing balances. Differences if any between book balance and actual stock listed out shall be reported to the concerned Chief Engineer.
4. They will so arrange their program of physical check of the store materials as to cover up all the important articles. All verification must be made in the presence of the concerned custodian who will be required to sign the verification sheets or inventories as a token of the acceptance of the correctness of entries.
5. The Verifiers shall record the following certificate in the Registers "Certified that the actual Stocks of _____ on hand are verified by me on the date noted against each and found to be correct"
6. If the physical balance as per the findings of the verifier agrees with the balance, the Verifier will affix his dated initials in register on the next line with the dated initials of the Custodian of Stores and the Stores Officer.
7. The actual counted figures agreed upon by the Custodian of Stores and the Stores Officer, will be the basis for regulating future balances, the differences being taken up separately through the concerned Chief Engineer. Wherever differences are observed between the book (ledger) balances and the counted balances, the postings shall be checked, the case for the differences investigated and instructions recorded in the ledger maintained by the Verifier.
8. The result of such verification shall be recorded in the progress reports (Appendix 2900J) to be submitted to the Chief Engineer. Each article counted shall be carefully examined and its condition shall be noted in the progress report. Also materials, which have not been operated upon for more than one year noted and explanation called for. The report must be handed over to the Stores Officer for record.
9. The Verifiers will also see that orders of the concerned Chief Engineer passed on the different statements are given effect to promptly and action is taken to adjust all shortages and surpluses in balances.
10. They shall verify whether list of surplus, obsolete and unserviceable articles are promptly submitted and disposed off.
11. The Verifier shall furnish a certificate in the progress reports to the effect that the accounts prescribed in the Public Works Department Manuals are properly maintained.
12. The progress reports will be prepared in triplicate, with original copy submitted to the Stores Officer who will record his remarks and submit it to the concerned Chief Engineer through the Executive Engineer. The duplicate copy submitted directly to the concerned Chief Engineer. The Verifier will retain the triplicate copy for his reference.
13. The Verifier shall also furnish his remarks in the progress reports about the adequacy of arrangements made for the custody of materials.
14. The Verifier has also to verify whether reports are periodically sent to the Executive Engineer.

2919. Disposal**2919.1. Disposal of Equipments.**

It is unnecessary and costly to maintain old, obsolete and unserviceable equipments. Every year the Executive Engineer shall review the equipments in his Division and sort out such items, which in his opinion fall within the above category and may be disposed. In respect of machinery items the advice of the competent mechanic/ Engineer/ government approved workshop may also be sought. After finalizing the list, a survey report shall be prepared. Sanction to this report shall be obtained from the competent authority before the disposal of equipments in public auction.

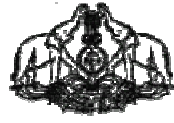
2919.2. Disposal of Unserviceable Articles

All care shall be exercised to prevent or minimize deterioration by proper care in storage and by timely issues. Some articles may deteriorate or become unserviceable due to long storage. Frequent inspection of the stores is to be undertaken to identify such articles likely to get deteriorated, provide them with proper protection if it is lacking. The inspecting officer shall report the matter to Chief Engineer and with his approval arrange for open sale of the article before it actually gets deteriorated or unserviceable.

An article that has already become unserviceable must be removed from the stores to a suitable place where these unserviceable articles can be retained till disposal. The Stores Officer shall conduct necessary enquiries as to the reason for the article having become unserviceable and obtain sanction from competent authority to dispose of the unserviceable articles through a survey report giving a clear history of the matter. After such sanction is received, the articles shall be disposed off in public Auction.

2919.3. Dismantled Materials

In any work the dismantled materials obtained shall be properly accounted as per **Appendix 2900K**. As far as possible, serviceable dismantled materials shall be utilized for the concerned work or issued to any other work. Dismantled materials remaining unutilized shall be physically verified and disposed off in public auction after preparing necessary survey report and sanctioning it by the competent authority. All unserviceable dismantled materials obtained shall also be disposed off in a similar manner.



GOVERNMENT OF KERALA

Kerala Public Works Department Manual
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PART – III

APPENDICES

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Appendix 200 A

QUESTIONNAIRE (Vide item 10 of section 203.3, under Superintending Engineer)

1. Is the division having adequate staff? if not, indicate where it is deficient.
2. Is the technical and ministerial staff distributed properly according to requirements?
3. Are there sanctioned posts left vacant; if so why?
4. Is there sufficient number of scientific and mathematical instruments? Are they in good working condition? If there is deficiency indicate the same.
5. Are the tools and the plant and the staff to man them adequate?
6. Have steps been taken to forecast and procure the requirements of departmental materials?
7. Are the arrangements for conveyance of the required materials to different work sites adequate?
Has action been taken and followed up in all cases where land acquisition is involved? If not indicate cases where delays are noticed.
8. Have estimates been prepared for all budgeted works; if not what are the steps taken?
9. Have steps been taken to regularize works started without adequate funds? Give details.
10. Are there works started without Administrative Sanction or Technical Sanction? If so give details and reasons.
11. Has a Review of expenditure vis-à-vis budget provision been made with regard to works under various head? If so where performance budget has been introduced, has the review of the performance been made in accordance with the performance budget?
12. Have estimates been prepared and sanctioned for all budgeted works? If not, indicate the present position regarding estimates as given below:
 - a. No. of works not yet investigated,
 - b. No. of works investigated and in the design stage.
 - c. No. of works where estimate is under preparation or scrutiny.
 - d. No. of works where investigation design or estimate is held up on account of some special reasons.
13. Has a test check of the designs approved by the Executive Engineer been made? If so, are these in accordance with standards followed in the Department? Where type designs are available are these being adopted?
14. Are there cases where the actual cost of work has exceeded or is likely to exceed the Sanctioned Estimate by more than 50%? If so, make a case study and indicate the principal reasons for the excess and how such large excess can be avoided in future.
15. Have all safety precautions been taken in the works under execution?
16. Have the various registers like Revenue Register Tender Register, Building maintenance register, Acquittance roll been examined? What are the general conclusions after a review of the register?
17. Are service books kept up-to-date?
18. Has a test check of overtime allowances paid been made? If so, does this disclose any abnormalities or irregularities?
19. Has a test check been made regarding wages of workers to whom Factory Act is applicable? If so does this disclose any irregularity?
20. Has the Executive Engineer inspected the Subdivision office and Stores if any under his control during the year? If so review any one of the inspection registers of the Executive Engineer and indicate the findings.
21. Are labour gangs in different sections of roads adequate?
22. Is sufficient number of quarries available?
23. Is road traffic statistics conducted and details kept in proper form?
24. Are there pending replies to remarks of Audit reports, inspection reports and public accounts, committee estimates committee etc? If so give details.
26. Have sufficient computers installed in Divisions and are they operational? If not, action taken.

DELEGATION OF POWERS

Appendix – 200B

1. Administrative Powers

Sl No	Nature of powers	Chief Engineer	Superintending Engineer	Executive Engineer	Assistant Executive Engineer	Assistant Engineer	Administrative Officer	Remarks	
1	Creation of posts	Part time contingency post & make appointments							
2	Appointments subject to PSC rules of Sanctioned posts	CE Administration and Designs to make appointments up to lowest gazetted post	Non Gazetted Posts in circles (temporary or permanent)	Upper Division clerk and Overseer Grade II	Lower Division clerk and Third grade Overseer		To appoint and promote non-gazetted ministerial officers and last grade employees in the headquarters units with concurrence of concerned CE		
		Menials charged to office contingencies							
3	Transfers and postings	All officers whom he is competent to appoint.	All NGOs & AEs within the circle	All NGOs within the Division	All NGOs within the subdivision		Within the headquarters unit whom he is competent to appoint		
		Post any officer whom he is competent to appoint for special duty for a period not exceeding one year.	Post all non-gazetted officers working under him on working arrangements for a period not exceeding six months.		Same as EE but for a period not exceeding three months.				
		Provided the strength in the cadre is not exceeded, no special allowance is payable on account of the special duty. Postings in gazetted cadre shall be intimated to government The officer ordering working arrangement is authorised to order payment of TA and meet the MO charges for sending their pay, as and when found necessary.							
		To detach officers whom he is competent to appoint from one office and fix another office as their headquarters on working arrangements for a period not exceeding six months in exigencies of public service.							
		Fix the headquarters and jurisdiction of all section offices including individual works	Recommend removals and transfers of Divisional and Sub divisional Officers from his Circle						
4	Sanction of Leave	Casual leave to all subordinate officers.				Casual leave to all gazetted officers up to and including Administrative Assistants in the			

							headquarters unit	
		Surrender of earned leave, subject to eligibility, to all officers working under him.						
		All kinds of leave except study leave, leave without allowance exceeding 120 days and special disability leave to all officers and staff under him					To sanction leave, other than study leave and special disability leave, to those whom he is competent to appoint	CE (A&D) to sanction charge allowance for additional charge as per rules
5	Impose minor punishment on any officer serving under him	Other than Superintending Engineers or officers of equivalent rank.	Other than Executive Engineers.	other than Asst. Executive Engineers	other than Assistant Engineers	Any non-gazetted officer working under him.	To institute disciplinary proceedings against those whom he is competent to appoint.	Powers subject to Kerala Services Rules
		Dismiss, degrade, suspend, effect recovery from pay, discharge and retire under rules, or to accept resignation of any officer whom he is competent to appoint.				Suspend any non-gazetted officers working under him		Subject to Kerala Services Rules and other rules laid down by Government from time to time.
6	Sanction of Tours for subordinate staff	Within the country, except for journey by air	Within the state and in the adjoining districts of neighbouring states	Tour within the state.	Tour within his jurisdiction	Tour within his jurisdiction		Journey outside the state for CEs require Govt. sanction. All journeys by air also require Govt. sanction.
No separate sanction is required for sanctioning travelling allowance to an officer for journey outside jurisdiction undertaken on the orders of competent authority. Attendance certificate shall be produced by non-gazetted officers. CE to sanction the cancellation charges already incurred by an officer for journey approved by the Chief Engineer and subsequently cancelled for valid reasons.								
7	Provident Fund	Sanction temporary withdrawals from provident fund deposits without monetary limit & nonrefundable withdrawals from PF upto 3/4th of the balance at the credit of the subscriber..	Sanction NRA equal to an amount of Rs 1 lakh or ½ the amount standing to the credit of subscriber or 5 times basic pay, whichever is less.	Sanction NRA equal to an amount of Rs 75,000 or ½ the amount standing to the credit of subscriber or 5 times	Sanction NRA equal to an amount of Rs 50,000 or ½ the amount standing to the credit of subscriber or 5 times	-	To countersign and forward applications for admission to Provident Fund from members of staff of the headquarters and Sanction Sanction temporary withdrawals from provident fund deposits without monetary limit to his subordinate officers	Subject to conditions and limitations under GPF (Kerala) Rules.

				basic pay, whichever is less.	basic pay, whichever is less.			
8	Increments	To execute agreement in respect of advance sanctioned and to execute agreements and reassignments of Insurance policies offered as collateral security to all officers under his administrative control.	Deputy CE shall sanction increments to all non-gazetted staff in the Circle. To fix pay of all non-gazetted officers.	Sanction increments to all non-gazetted staff in the Division. To fix pay of all non-gazetted officers.	Sanction increments to all non-gazetted staff in the Division and Sub-division. To fix pay of all non-gazetted officers.		To sanction increments to those whom he is competent to appoint. To fix pay of all non-gazetted officers.	DCE admin to sign Increment Certificates of non-gazetted technical staff of the headquarters unit
9	Advance TA	Sanction advance TA, 15 days before the actual journey	Nil	Nil	Nil	Nil	Nil	
10	Sanction Reimbursement of medical expenses	To all subordinate officers				Nil		Subject to Govt Servants Medical Benefit Rules.
11	Investigation of arrear claims	To sanction investigation of arrear claims including claims which cannot be verified by audit due to limited period of preservation.					To sanction investigation of arrear claims including claims of not more than five years old, excluding time-barred claims.	
12	Training facilities to officers	To depute technical hands to seminars, short term courses and for study purposes within India.						Training programme shall be monitored by HRD Cell.
13	Sanction shifting of telephones	To sanction shifting of or disconnection of the phones in his jurisdiction.		To sanction shifting of phones in his jurisdiction.				
14	Sanctioning of TA bills	To sanction TA Bills of all staff working under him and his TA Bills.	To sanction TA Bills of all staff working under him.				Countersign TA bills of non-technical Gazetted Officers in the headquarters unit below the rank of the Administrative Officers.	TA Bills shall be sanctioned within 15 days after receipt and kept ready for payment.

2. Financial Powers

		Chief Engineer	Superintending Engineer	Executive Engineer	Assistant Executive Engineer	Assistant Engineer	Remarks
1	Administrative Sanction						
A	<i>Original Works</i> (i) Original works	Rs. 50 lakhs	Rs. 20 lakhs	Rs. 15 lakhs	Rs 200000	Nil	GO (P) No. 667/2000/Fin dated 22/3/2000
	(ii) Electrification/ Electronics Works	Rs. 7 lakhs	Rs. 3 lakhs	Rs. 2 lakhs	Rs. 50000	Rs 15000	
	(iii) Investigation of schemes	Unlimited (budgeted works) Rs. 8 lakhs (for all works)	Rs. 5 lakhs (for all works)	Rs. 2 lakh	Rs. 50,000	Nil	
	(iv) Contribution works	Rs. 50 lakhs	Rs. 20 lakhs	Rs. 15 lakhs	Rs 75000	Nil	
B	<i>Repairs</i> (i) Special repairs of Buildings	Rs. 10 lakhs	Rs. 6 lakh	Rs. 300000	Rs 75000	Nil	
	(ii) Ordinary and Special repairs Electrical	Rs. 5 lakhs	Rs. 200000	Rs. 50000	Nil	Nil	
	(iii) Repairs of Roads	Rs. 15 lakhs	10 lakhs	Rs. 6 lakhs	1.5 lakhs	Rs. 10,000	
2	Technical Sanction						
	(i) Original, maintenance and investigation & contribution	Unlimited	Rs. 100 lakhs (R) Rs. 250 lakhs (B)	Rs. 50 lakhs (R) Rs. 100 lakhs (B)	Rs. 5 lakhs (R) Rs. 6 lakhs (B)	Rs. 100000 (R) Rs. 100000 (B)	GO (P) No. 667/2000/F in dated 22/3/2000
	(ii) Electrification/ Electronics works	Unlimited	Rs. 50 lakhs	Rs. 20 lakhs	Rs. 200000	Rs. 15,000	
4	Sanction for Purchase, Manufacture and Repairs of Stores including T&P						
	(i) Sanction for purchase of T&P charged to work	Rs. 15 lakhs	Rs. 10 lakhs	Rs. 5 lakhs	Rs. 100000	Rs. 15,000	GO (P) No. 667/2000/Fin dated 22/3/2000
	(ii) Sanction for purchase of T&P not charged to work (excluding motor vehicles)	Rs. 15 lakhs	Rs. 10 lakhs	Rs. 5 lakhs	Rs. 100000	Rs. 15,000	
	(iii) Sanction for materials other than T&P	Unlimited	Rs. 10 lakhs	Rs. 5 lakhs	Rs. 100000	Rs. 15000	
	(iv) Sanction for purchase of Stock articles T&P required for electrical/electronic works	Unlimited	Rs. 3 lakhs	Rs. 100000	Rs. 25000	Rs. 5000	

	(v) Sanction for repairs of Motor Vehicles	LMV Rs. 50000 others Rs. 50000	LMVRs. 30000 others Rs. 40000	LMV Rs. 10000 others Rs. 15,000	LMV Rs. 3000 others Rs. 4,000	AE LMV Rs. 1000	
	(vi) Sanction for repairs and carriage of T&P	Unlimited	Rs. 7 lakhs	Rs. 200000	Rs. 25,000	Rs. 5,000	
5	Sanction of Survey Reports						
	(i) For disposal of stores	Unlimited	Rs. 5 lakhs	Rs. 200000	Rs. 50,000	Rs. 10,000	
	(ii) For disposal of buildings	Unlimited	Rs. 50 lakhs	Rs. 25 lakhs	Rs. 5 lakhs	Nil	
	(iii) unserviceable articles including T7P and improvements in acquired lands and trees (both living and dead)	Unlimited	200000	100000	50000	50000	Go (P) no. 128/PW dated 17.6.1968
6	Write off						
	Of stores on account of deficiency or deterioration	To value of Rs. 100000 at a time (annual limit 10 lakhs)	Rs. 10,000 at a time (annual limit Rs. 500000)	Nil	Nil	Nil	GO (P) No. 667/2000/F in dated 22/3/2000
7	Contracts and Tenders						
	(i) Invitation of Tenders and execution of agreements						

	(a) All works except item (b) below	Unlimited	Unlimited	Upto his TS powers	Upto his TS powers	Upto his TS powers	GO (P) No. 667/2000/Fin dated 22/3/2000
	(b) Electrical / Electronic works	Unlimited	Unlimited	Upto his TS powers	Upto his TS powers	Upto his TS powers	
	(c) Purchase of materials and T & P	Unlimited	Unlimited	Same as for sanction of purchase	Same as for sanction of purchase	Same as for sanction of purchase	
	ii) Waiving of tender calls	Upto Rs. 25 lakhs	Upto 10 lakhs	Rs. 300000	Rs.50000	Rs.10,000	
8	Miscellaneous powers						

	(i) Passing and payment of bills	Bills other than work Bill - Unlimited	Bills other than work bill - Unlimited	All bills without monetary limit	1.Part and Final payments for contract entered into by him (including approved tender excess and excess over estimate). 2.All bills relating to supplies and services within his competency of sanction	1. Passing of all bills including work bills, bills relating to supplies and service and contingent bills (recurring and non recurring) within his powers of sanction	
	(ii) To draw temporary advance for payment of vouchers	within his powers of payment	within his powers of payment	within his powers of payment	within his powers of payment	payment of bills, vouchers within his powers of payment.	
	(iii) Sanction refund of revenue	Unlimited	Rs. 3 lakhs	Rs. 50,000	Rs. 2000	Nil	
	Sanction re-appropriation of Funds	Unlimited	Unlimited	Rs. 50000	Nil	Nil	
	(iv) Office Expenses (Non-recurring)	Rs.100000 in each case	Rs. 50,000 in each case	Rs. 25,000 in each case	Rs.5,000 in each case	Rs. 1000 in each case	GO (P) No. 667/2000/Fin dated 22/3/2000
	(v) Office Expenses (Recurring)	Expenses relating to his office and those under his charge	Expenses relating to his office and those under his charge	-do-	-do-	-do-	
	(vi) Purchase of books and periodicals	Unlimited	Rs. 7,000 (A.L. 15,000)	Rs. 10,000 (A.L. 25,000)	Rs. 2,000 (A.L. 4,000)	Rs. 750 (A.L. 1,500)	

	(vii) Purchase of stationery	Rs. 10,000 at a time (A.L. 100000)	Rs. 15,000 at a time (A.L. 75,000)	Rs. 10000 at a time (A.L. 50,000)	Rs. 10000 at a time (A.L. 20000)	Rs. 10000 at a time (A.L. 1,0000)	
	(viii) Purchase of Scientific and Mathematical instruments	Unlimited	Rs. 50,000 (AL)	Rs. 100000 (A.L)	Rs. 20,000 (A.L)	Rs. 5000 (A.L)	
	(ix) Sanction for purchase of Office furniture	Unlimited	Rs. 50,000 at a time (A.L. 2.5 lakhs)	Rs. 25000 at a time (A.L. 1.5 lakhs)	AEE Rs. 15,000 at a time (A.L. 50,000)	Rs. 2,000 at a time (A.L. 10,000)	
	(x) Printing of forms reports pamphlets, notices photo copying, stenciling ammonia printing	Rs. 200000 (A.L.)	Rs. 100000 (A.L.)	Rs. 5,0000 (A.L.),	Rs. 5,000 (A.L.)	Rs. 2,000 (A.L.)	
	(xi) Replacing spares of vehicles without consulting mechanical wing	Rs. 25,000 at a time (A.L. Rs. 100000)	Rs. 10000 at a time (A.L. Rs. 50,000)	Rs. 5000 at a time (A.L. Rs. 30,000)	Rs. 2500 at a time (A.L. Rs. 15000)	Rs. 750 at a time (A.L. Rs. 3,000)	
	(xii) Advertisement Charges	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	
	(xiii) Photographic Charges	Unlimited	Rs. 50000 in each	Rs. 25,000	Rs. 5000	Rs. 1000	
	(xiv) Demurrage/ Wharfage Charges	Rs. 20,000 in each case	Rs. 10,000	Rs. 5,000	Rs. 1000	Nil	
	(xv) Workmen's Compensation	Unlimited	Unlimited	Nil	Nil	Nil	
	(xvi) Renting of private buildings	Rs. 50000	Rs. 25000	Rs. 15000			
	(xvii) Rent Fixation	Unlimited	Rs. 40000 per month	Rs. 20000 per month	Rs. 10000 per month	Rs. 5000 per month	
	(xviii) Issue of Rent Certificate	Unlimited	Unlimited	Unlimited	RS. 10000 per month	Rs.5000 per month	
	(xix) Valuation of Buildings	Unlimited	Rs. 100 lakhs	Rs. 25 lakhs	Rs. 6 lakhs	Rs. 50,000 Rs. 1.5 lakh (Plinth area valuation)	
	(xx) Sanction lease of usufructs of trees and land	Rs. 10 lakhs/year in each case not exceeding 3 years	Rs. 2 lakhs/year in each case not exceeding 3 years	Rs. 100,000/year in each case not exceeding 3 years	Rs. 50,000/year in each case not exceeding 3 years	Rs. 10,000/year in each case not exceeding 3 years	GO (P) No. 667/2000/Fin dated 22/3/2000

	(xxi) Sanction auction of right for conduct of ferries / canteen etc	Unlimited	Upto Rs. 5 lakhs and powers for confirmation and remission of revenue on account of interruption	Upto Rs. 200000	Upto Rs. 50,000	Nil	
	(xxii) Sanction right for collecting toll at bridges	Rs. 100 lakhs	Nil	Nil	Nil	Nil	
	(xxiii) Auction of articles and buildings						
	(a) Conduct of auction	Unlimited	Unlimited	Unlimited	Upto an assessed value of Rs. 200,000	Upto an assessed value of Rs. 50000	
	(b) Confirmation of auction	Unlimited (even if bid amounts is less than 50% of the assessed value)	Unlimited (Provided the bid amount is not less than 50% of assessed value)	Confirmation of auction conducted by him if the bid amount is not less than 75% of assessed value	Confirmation of auction conducted by him if the bid amount is not less than 75% of assessed value	Confirmation of auction conducted by him if the bid amount is not less than 75% of assessed value	
	(xxiv) Approval of designs for engineering structures (Monetary limit)	Unlimited	Rs. 200 lakhs	Rs. 100 lakhs	Rs. 25 lakhs	Nil	
	(xxv) Arranging works departmentally	Rs, 100 lakhs	Rs. 50 lakhs	Rs. 25 lakhs	Rs. 5 lakh	Rs. 100,000	
	(xxvi) Expenses for conducting Training CE, DRIQ	Rs. 50,000 (max) per course of two weeks subject to a minimum of 15 participants (annual limit 10 lakhs)					
	(xxvii) Expense for conducting Seminars and Technical discussion CE, DRIQ	Rs. 20,000 per discussion (A.L. Rs. 2lakhs)					GO (P) No. 667/2

	(xxviii) Sanction of estimate for eviction of encroachments	Rs. 25 lakhs	Rs. 15 lakhs	Rs. 10 lakhs (A.L.)	Rs. 2 lakh (A.L.)	Nil	
	(xxix) Imprest for expenditure on removal of fallen trees, earth slips, diverting stagnant water					Rs 10000 at a time Monthly limit 50000	
	(xxx) Imprest for Departmental Execution					Rs 10 Lakhs at a time	

* - GO (P) NO. 667/2000/FIN Dated 22.03.2000

Note: 1. Joint Director, KHRI shall exercise powers delegated to Executive Engineers in all the relevant items

Administrative Powers of Chief Architect PWD

Sl. no	Nature of powers	
1	Creation of posts	Part time contingency post & make appointment
2	Appointments subject to PSC rules	Appointments up to lowest gazetted post of Sanctioned posts
3	Transfers and postings	All officers whom he is competent to appoint Post any officer whom he is competent to appoint for special duty for a period not exceeding one year. To detach officers whom he is competent to appoint from one office and fix another office as their headquarters on working arrangements for a period not exceeding six months in exigencies of public service
4	Sanction of Leave	Casual leave to all subordinate officers. Surrender of earned leave, subject to eligibility, to all officers working under him. All kinds of leave except study leave, leave without allowance exceeding 120 days
5	Impose minor punishment on any officer serving under him	Powers subject to Kerala Services Rules
6	Sanction of Tours for subordinate staff	Within the country, except for journey by air
7	Provident Fund	Sanction temporary withdrawals from provident fund deposits without monetary limit & nonrefundable withdrawals from PF upto 3/4th of the balance at the credit of the subscriber. Subject to conditions and limitations under GPF (Kerala) Rules
8	Increments	Sanction increments to all non-gazetted staff. To fix pay of all non-gazetted officers.
9	Advance TA	Sanction advance TA, 15 days before the actual journey.

10	Sanction Reimbursement of medical expenses	To all subordinate officers. Subject to Government Servants Medical Benefit Rules
11	Training facilities to officers	To depute technical hands to seminars, short term and for study purposes within India. Training shall be monitored by HRD Cell
12	Sanction shifting of telephones	To sanction shifting of or disconnection of the phones in his jurisdiction
13	Sanctioning of TA bills	To sanction TA Bills of all staff working under him. TA Bills shall be sanctioned and after receipt and kept ready for payment within 15 days

Appendix 200 C

Space Standards :

Design of Quarters :

Classified into 5 categories according to the scale of pay as given in the Table below :

Sl. No.	TYPE	Floor Area in m ² per unit	Scale of Pay (2009)
1	I	60	8500-13210 to 8960-14260
2	II	80	9190-15780 to 15380-25900
3	III	100	16180-29180 to 21240-37040
4	IV	120	22360-37940 to 44640-58640
5	V	196	46640-59840

Quarters for Judiciary Staff:

(As per G.O. (MS) No. 31A/95/Home dated 06-10-1995)

Sl. No.	Designation	Floor Area in m ² per unit
1	Munsiff/ Magistrate	100
2	Sub Judge/ Chief Judicial Magistrate	140
3	District Judge	196

Standards of space allotment for various types of Buildings :

1. School Buildings

1.1 For Primary Schools.

Class Room : Minimum of 1 sq.m per student

1.2 For Secondary Schools.

Class Room : Minimum of 1 sq.m per student

1.3 For Colleges(Arts & Science)

Lecture Hall : Minimum of 1.2 sq.m per student

Laboratory : Minimum of 2.5 sq.m per student

The requirement for Professional Colleges will be suggested by the authorities concerned.

2. Standards for student hostels

2.1 For Dormitories : Minimum of 4.5 sq.m per student

For triple occupancy : Minimum of 6.5 sq.m per student

For Double occupancy : Minimum of 7.5 sq.m per student

For Single Occupancy : Minimum of 9.0 sq.m per student

2.2 Standards For sanitary requirements :

Relevant Rules in KMBR shall be followed.

For Office buildings, officers with basic pay 36140 and above are eligible for separate toilet.

3. Space standards for tourist Bunglows

3.1. Economic Class :

Area for Single Room : 12 sq.m. excluding toilets

Area for Double Room : 18 sq.m. excluding toilets

3.1. Upper Class :

Area for Single Room : 15 sq.m. excluding toilets

Area for Double Room : 20 sq.m. excluding toilets

Minimum Space Standards for Government Officials

1. For Gazetted Officer 15 sq.m.
2. For Non-gazetted Officer 3.75 sq.m
3. For Records 10% of the Item no.2 above

Appendix 400 A

Areas covered under Integrated Computerised MIS (section 406.5)

Core Business Function	Core Operations Functions	Contracts /Project Management	Contractor Management	Technical Tools to assist core business functions	Finance and Account function	Human Resources Development	Network and Information Systems Management	Office Automation
<ul style="list-style-type: none"> · Roads Information system (with GIS) · Roads Maintenance Management · Roads Safety Management/Accident Info System · Bridges Management · Pavement Management · Traffic Management System · Toll ways Management System · Real-time Traffic Control and Monitoring System · Investigation and Planning · Design & Analysis · Works/Construction Management · Decision Support Systems · Stakeholders Management Systems · Strategic Performance Reporting & Management · Integrated Computerised Information System 	<ul style="list-style-type: none"> · Inventory/ Assets Management · Procurement and Tender Management · Revenue: Billing & Collection · Budget Planning & Monitoring · Contracts Management · Contractors Management · Projects Management · Stores Accounting · Environment Management · Social and RAP · Monitoring & Learning System · Measurement Book computerization 	<ul style="list-style-type: none"> · Contracts · Contracts Administration · Planning · Tendering · Planning · Costing · Funding · Resource Management · Billing · Progress Report 	<ul style="list-style-type: none"> · Contractor Profile · Projects in progress /completed · EMD & BG · Bills Raised · Stage-wise payments made · Recoveries Due · Performance 	<ul style="list-style-type: none"> · Computer Aided Design Tools · Modeling and Simulation Tools · Structural Analysis Tools · Sattelite Imagery · Interpretation/ editing tools · Aerial Photography / Other · Integration Tools · GIS environment · Technical Databases and Standards · Electronic Documents Management System 	<ul style="list-style-type: none"> · General Ledger · Accounts Payables · Accounts Receivables · Assets Valuation · Funds Flow Management · Cash Management · Cheque Books Management · Treasury Management · Budgeting · Financial Controls · Financial Reporting · Pay Roll Accounting · Expense and Travels · Measurement Book computerization 	<ul style="list-style-type: none"> · Personal Files · Service records · Salary Records · Seniority, Promotions and Transfers · Training and Career Development · Performance Appraisals · Skills Inventory · Capability Profile · Employee Payroll · Expense and Travel Processing · Leave Records · Loans and Advances · PF/ESI · Staff Welfare · Knowledge Management and On-Line Training · Policies and Employee related Information 	<ul style="list-style-type: none"> · PWD Website / Portal: WINGS · Secure Department Intranet / WAN for employees & internal stakeholders · Secure Extranet for external stakeholders and agencies · Public Access portal · HW, SW & Networking Facilities Management · Configuration Management · Formats & Reports Management 	<ul style="list-style-type: none"> · e Mail · Messaging · Workflow automation · Groupware · MS Office equivalent tools · Files Tracking · Library Information Management · Legislative Assembly & Parliamnet Q&A · Litigation and Court Cases Tracking · Land Acquisition Cases Tracking · Legacy Data, Maps, Drawings, files digitization.

A Arc	Assistant Architect
AA	Administrative Assistant
AD	Assistant Director
Admn.	Administration
AE	Assistant Engineer
AEE	Assistant Executive Engineer
AO	Administrative Officer
Arc	Architect
Ar HD	Architectural Head Draughtsman
Bldg.	Buildings
Brd.	Bridges
C Arc	Chief Architect
CA	Confidential Assistant
CC	Central Circle
CE	Chief Engineer
Conc.	Concrete
DA	Divisional Accountant
DCE	Deputy Chief Engineer
DD	Deputy Director
Dsn	Design
Dm	Draughtsman
Dir	Director
EE	Executive Engineer
Ele.	Electrical
Els.	Electronics
Env.	Environmental
FA	Financial Assistant
FC	Financial Controller
FO	Financial Officer
FP	Flexible Pavement
Ge	Geologist
Gnl	General
HC	Head Clerk
In	Investigation

JC	Judicial Circle
JD	Joint Director
JS	Junior Superintendent
KHRI	Kerala Highway Research Institute
KRFB	Kerala Road Fund Board
KSTP	Kerala State Transport Project
LDC	Lower Division Clerk
LSGD	Local Self Government Department
min.	Ministerial
NC	North Circle
NH	National Highways
Op	Operations
Ovr	Overseer
PF	Provident Fund
Plng	Planning
PM	Personal Management
PPU	Project Preparation Unit
PR	Public Relations
Prj	Projects
QC	Quality Control
QM	Quality Management
R & B	Roads & Bridges
Rds	Roads
R	Research
RS	Road Safety
SC	South Circle
SE	Superintending Engineer
SM	Soil Mechanics
SS	Senior Superintendent
Trc	Tracer
Tech.	Technical
Trf	Traffic
Tr.	Treasury
UDC	Upper Division Clerk
V	Vehicle

Legend- abbreviations Used

Appendix 500 A

Major PWD Head of accounts

Major Head Code	Major Head Name	Major Head Description
2059	Public works	Public works Revenue Section
3054	Roads and Bridges	Roads and Bridges Revenue Section
4059	Capital Public Works	Capital Section Outlay on Public Works
0059	Public Works Revenue	Public Works Revenue
1054	Roads and Bridges	Roads and Bridges
5054	Capital Outlay on Roads and Bridges	Capital Outlay on Roads and Bridges
4202	Capital Outlay Education. Sports art and culture	Capital Outlay Education. Sports art and culture
4216	Housing	Capital outlay on Housing
4210	Medical and Public Health	Capital outlay on Medical and Public Health
4211	Family Welfare	Capital outlay on Family Welfare
4225	Welfare of SC/ST and other backward classes	
4235	Social Security and welfare	Capital outlay on Social Security and welfare
4403	Animal Husbandry	Capital outlay on Animal Husbandry
4405	Fisheries	Capital outlay on Fisheries
4058	Stationary and Printing	Capital outlay on Stationary and Printing
3452	Tourism	
5452	Tourism	Capital outlay on Tourism
5475	General Economic Services	Capital outlay on General Economic Services
3054-80-799-95		Suspense Account

Appendix 500 B

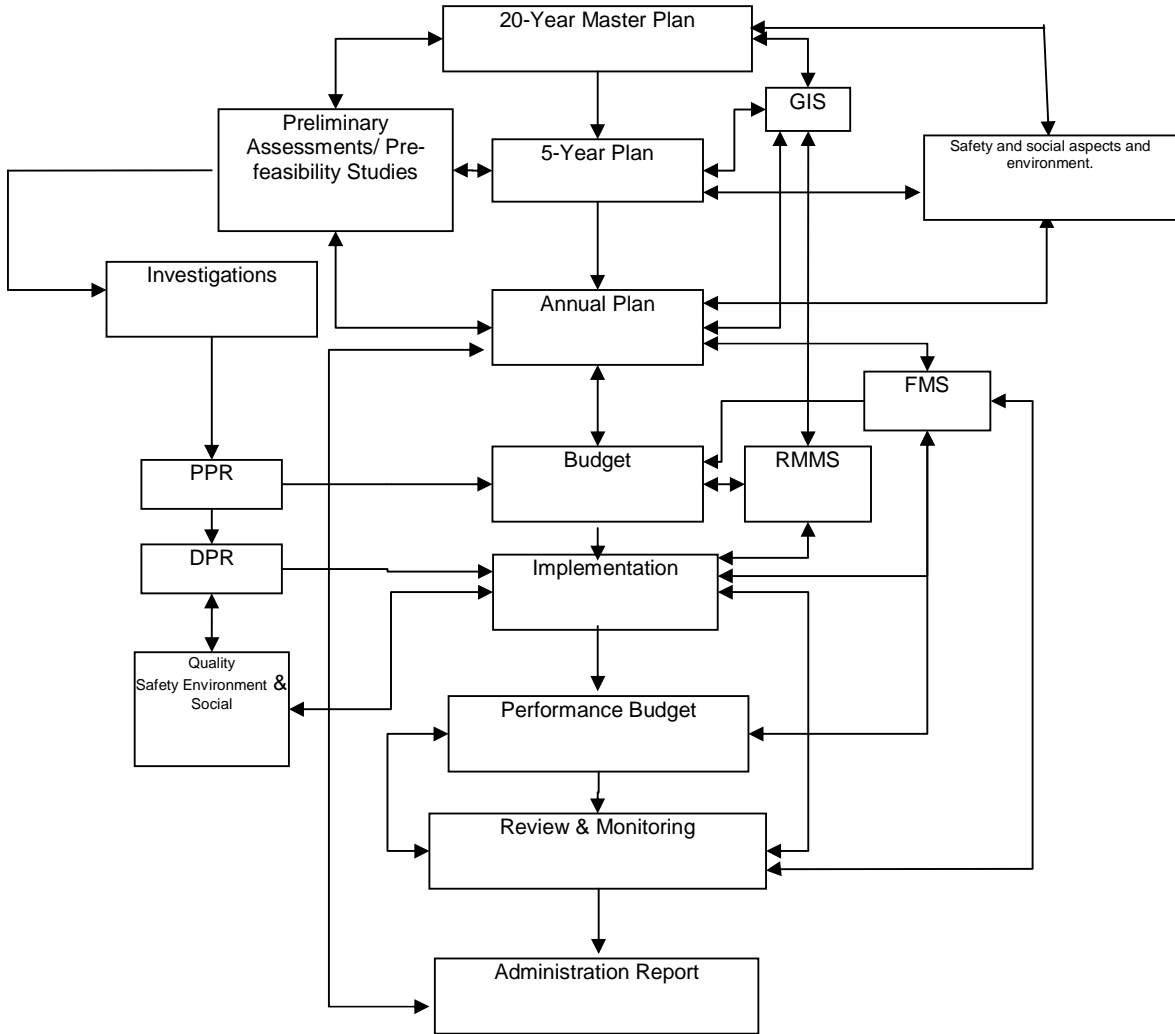
Plan Works 9 (section 503)

SI No.	Status Code	Work Name	Head of account	AS no. with date	AS amount	TS no. with date	TS issuing authority (CE/SE/EE/AEE)	TS amount	Agreement No with date	Agreement period of completion in months	Office with whom Agreement Executed	Agreed contract Amount (in Rs)	Expenditure incurred till date	Name of Contractor	Contractor code

Appendix 500 C

Non-Plan Works (section 503)

SI No.	Status Code	Work Name	Head of account	STLF order no. with date	Amount Allotted	TS no. with date	TS issuing authority (CE/SE/EE/AEE)	TS amount	Agreement No with date	Agreement period of completion in months	Office with whom Agreement Executed	Agreed contract Amount (in Rs)	Expenditure incurred till date	Name of Contractor	Contractor code



Appendix 700A

Orders of the Government of India regarding the Procedure for payment from the fund

1. The money lying in the Fund exists in three different forms (i) Payments from Road Fund Allocations; (ii) The Central (Ordinary) Reserve and (iii) The Central Special Reserve.

Payments from Roads Fund Allocation of States

2. Under Paragraph 7 of the Road Fund Resolution, the sums allocated for expenditure in the States can be spent only on the objects specified in that paragraph and such expenditure requires the PREVIOUS APPROVAL of the Central Government. Before approving a proposal for expenditure from the Road Fund Allocations of a State, the Central Government are required to refer it to the Standing Committee for Roads, vide para 9 (4) of the Resolution. It will, therefore, be necessary for the State concerned to obtain the previous approval of the Central Government to schemes, which they intended to finance wholly, or partly from the State's Road Fund Allocations. They must do this before incurring, any commitments on these schemes. They need not send the estimates to the Centre for approval of any works proposed to be financed from the Road Fund Allocations, though such estimates may be sent for technical advice to the Roads Organisation of the Ministry of Transport if the State wishes to do so.
3. Quarterly allotments will be made by the Central Government from the allocations held by them to the credit of the State Government concerned for expenditure in specific schemes, which have been previously approved by the Central Government.
4. Audit is required to see that expenditure on any scheme met out of allocations from the Central Road Fund is within the programme approved by the Central Government with the advice of the Standing Committee for Roads. For this purpose the Government of the State concerned, upon the receipt of the approval of the Central Government, shall intimate to them the name number and date of detailed estimate as (technically) sanctioned by the competent authority, the amount for which it is sanctioned the amount to be met from the State's Road Fund Allocations and a very brief description of the work which it comprises in those cases where the title of the estimate itself does not adequately convey its scope. This information will be passed on by the Government of India to audit with instructions that expenditure against the estimate in question may be adjusted against the State's Road Fund Allocations to the extent authorised.
5. The Accountant General or Comptroller concerned is authorised to pass an excess over the estimated cost of a scheme, as approved by the Central Government, up to a limit of 10% of the estimated cost. When the excess is more than 10%, the approval of the Central Government to the revised cost shall be obtained by the State Government concerned. This limit of 10% applies to excess over the amounts approved by the Government of India whether at the preliminary stage, when approval to schemes is accorded after obtaining the advice of the Standing Committee for Roads, or at the later stage when the final costs of works as per detailed estimates are intimated to Audit.

Payments from the road fund Central (Ordinary) reserve

6. Under paragraph 6 of the Road Fund Resolution, the Central (ordinary) Reserve with the Government of India can be applied only for the purpose specified in that paragraph. Before approving a proposal for expenditure from the Central (Ordinary) Reserve the Central Government are required to refer it to the Standing Committee for Roads, vide, paragraph 9 (4) of the Resolution.
7. When an application is received by the Government of India for a grant from the Central (Ordinary) Reserve they will in the first instance satisfy themselves whether the proposed scheme is suitable and then refer it to the Standing Committee for Roads. If, in the light of the advice tendered by the Committee, the Government of India decide that a grant shall be given from the Reserve to the State Government or other administration or authority concerned, the Government of India will inform them that they will be prepared to meet from the Reserve the whole or a stated percentage of the estimated cost of the work, subject to a maximum limit, if necessary.
8. The State Government or other administration or authority concerned shall then submit detailed estimates, with plans etc. for each such scheme to the Government of India. After scrutiny of the estimates, the Government of India will communicate their technical approval and financial sanction to the State Government or other administration or authority concerned.
9. The competent authority will then accord (technical) sanction to the estimates, and the State Government or other administration or authority concerned shall then intimate to the Government of India the number, date and other particulars of the detailed estimates so sanctioned as in paragraph above. The Government of India will at once pass on this information to Audit and inform them that a contribution will be made from the Central (Ordinary) Reserve towards the expenditure against the sanctioned estimate to the extent decided upon.
10. Actual payments will be made by the Accountant General, Central Revenues, to the State Government or other administration concerned on the basis of the monthly audited expenditure on the work as communicated

to him by the State Accountant-General or Comptroller concerned.- subject to the limit of the contribution sanctioned by the Government of India.

11. Where the Accountant General, Central Revenue, is also the Audit Officer for a Chief Commissioner's State, he will make the necessary adjustments himself in his books, subject to the limit of the contribution sanctioned by the Government of India.

12. The State Accountant-General or Comptroller, or the Accountant General, Central Revenue, as the case may be, is empowered to pass any excess over a contribution from the Central (Ordinary) Reserve sanctioned by the Government of India up to a limit of Rs. 1,000 in any one case. When the excess is more than Rs. 1,000, an application may be made by the State Government or other administration or authority concerned for an extra grant from the Central (Ordinary) Reserve. In making such an application, the revised (detailed) estimates, if any, for the work shall also be submitted to the Government of India for technical approval and financial sanction, with a report explaining in full the reasons for the excess.

13. Applications, if any, for extra grants from the Central (Ordinary) Reserve, will be considered by the Government of India on the merits of each case in the light of the financial position of reserve and other circumstances prevailing at the time, but no assurance can be given that the extra grant required will be forthcoming. Therefore, while sanctioning a grant from the Central (Ordinary) Reserve initially the Government of India may require an assurance from the State Government or other administration or authority concerned that they will provide the balance of the funds that may be needed to complete the project from their own resources.

14. The procedure described in paragraphs above has been in force for the Provinces (now Part A States) since the Road Fund was instituted 20 years ago. It is a simple procedure quickly understood by the P. W. D. of the States and give no trouble in all these years.

Payments from the Road fund Central (Special) reserve

15. The Special Reserve is intended for expenditure on specified objects, vide paragraphs 3 (5) and 9 (4) of the Resolution. The procedure for the sanction of grants, and adjustment of expenditure from the special Reserve is the same as that for grants from the Central (Ordinary) Reserve.

16. Strict instructions have been issued to Audit not to admit expenditure from any of the subdivisions of the Central Road Fund. i.e. the Allocations, the Central (Ordinary) Reserve, and the Central (Special) Reserve, unless it has been authorised by the Central Government under the prescribed procedure described above. If, for any special reasons, it is described that expenditure shall be permitted from the Fund in anticipation of sanction of the Central Government in accordance with the above described procedure, their orders shall be obtained for the departure_ from the rules. Audit is not empowered to admit such expenditure from the Fund and will not do so unless authorised specifically by the Central Government

**Appendix 700 B
Monthly Progress Report**

_____ 5 Year PlanYY-YY - Annual Plan YY- YY Progress Report (Financial) for the month of
_____ YY

Rs in Lakhs

SI No	Name of Scheme	Head of Account	Plan Outlay	Budget Provision	Expenditure upto previous month excluding Share Debit	Expenditure excluding Share Debit during the month	Progressive Total	Expenditure upto previous Month including Share Debit during the month	Expenditure including Share Debit during the month	Progressive Total	Detailed Remarks and reason for shortfall

Appendix 700 C
Monthly Progress Report

_____ 5 Year Plan YY-YY - Annual Plan YY YY Progress Report (Physical) for the month of _____
YY

Sl No	Name of Scheme	Head of Account	No. of work in the budget Vol. I	No. of works completed upto 31 st march of YY) Previous	No. of works completed in the current year (YY-YY)	Progressive total	No, works in progress	Remark/s/ reasons for shortfall.

Appendix 700 D

Work Expenditure for the Month _____ of YY under plan heads

Sl No	Head of Account	Expenditure upto during _____ Previous month	Expenditure during _____ current month	Progressive total

Appendix 700 E

Administration Report

Buildings/ Roads & Bridges

Contents	Statement for Buildings	Statement for Roads & Bridges	Statement for DRIQ	Statement for Projects	Statement for National Highways
1 Introduction					
1.1 Period of report					
1.2 Performance of the Department					
1.3 Finance					
2 Organisation Structure					
2.1 Head Quarters Office with Organisation Chart					
2.2 Field Office Organisation Chart	I, II, III, IV, V, VI	I, II, III, IV, V, VI A	I, II, III, IV, V, VI B	I, II, III, IV, V, VI C	I, II, III, IV, V, VI D
2.3 Appointments of Scheduled Caste and Schedule Tribes in the Organisation	VII	VII	VII	VII	VII
3 Objectives and performance of the department					
3.1 Objectives					
3.2 Achievements	VIII, IX, IX A, X, XI, XII, XIII, XIII A	VIII, IX, X, XI, XII A to F, XIII	XII H to K	VIII, IX, X, XI, XII A, XII C, XII D, XIII	VIII, IX, X, XI, XII A, XII C, XII G, XIII
3.3 Original Works and Improvements					
3.4 Maintenance	XIV, XV	XIV A to D, XV	XV	XIV A to D, XV	XIV A, XIV D, XIV E, XV
4 Finance					
4.1 Sources of Fund					
4.2 Plan Outlay					

4.3	Annual Plan Outlay for YY- YY	XVI	XVI	XVI	XVI	XVI
4.4	Non Plan allotment for YY- YY	XVII, XVIII	XVII, XVIII	XVII, XVIII	XVII, XVIII	XVII, XVIII
4.5	Budget works for the welfare of scheduled caste, Schedule Tribes and other backward classes	XIX,XX	XIX,XX			
4.6	Central Government Grants other than flood relief					
4.7	Expenditure					
5	Monitoring					
5.1	Close monitoring of works at different levels					
5.2	Introduction of Malayalam as official language					
6	Conclusion					

Satetment I.

Chief Executives of the Department (_____ wing)

Minister (Works)	
PWD Secretary	
Chief Engineer (_____ wing)	

Satetment II.

Name of senior personnel of PWD _____ wing from Executive Engineer level and above during YY-YY

Sl No.	Name of Officer	Designation of post held	Period of Incumbency

Satetment III.

Circle wise details of Office

Sl No.	Name of Divisions under the circle	Name of Subdivision under the division	Name of sections under the subdivisions

Satetment IV.

List of Office/ Post newly created during the year YY-YY

Sl. No.	Name of Office	Designation	No. of Posts	Government order no. and date	Remarks

Satetment V.

List of offices/ Posts abolished during YY - YY

Sl. No.	Name of Office abolished	Designation	No. of Posts	Government order no. and date	Remarks

Satetment VI.

Name and number of Posts Category wise in various offices of PWD Buildings in YY-YY

Sl No.	Designation Category wise	Chief Engineers	Chief Architect	SE electrical	EE Electronics	No. Of posts				LSGD	Total	Remarks
						South Circle Trivandrum	Central Circle Thrissur	North Circle Calicut	Judiciary Ernakulam			

Satetment VI.A

Name and number of Posts Category wise in various offices of PWD Roads and Bridges in YY-YY

SI No.	Designation Category wise	Chief Engineers Office	No. Of posts			Administration	KRFB	Total	Remarks
			South Circle Trivandrum	Central Circle Aluva	North Circle Calicut				

Satetment VI.B

Name and number of Posts Category wise in various offices of PWD DRIQ in YY-YY

SI No.	Designation Category wise	Chief Engineers Office	No. Of posts			KHRI	Total	Remarks
			Buildings Design	Bridges Design	PPU			

Satetment VI.C

Name and number of Posts Category wise in various offices of PWD National Highways in YY-YY

SI No.	Designation Category wise	Chief Engineers Office	No. Of posts			Total	Remarks
			South Circle Trivandrum	Central Circle Ernakulam	North Circle Calicut		

Satetment VI.D

Name and number of Posts Category wise in various offices of PWD Projects in YY-YY

SI No.	Designation Category wise	Chief Engineers Office	No. Of posts		Total	Remarks
			Kottarakkra Circle	Muvattupuzha Circle		

Satetment VII.

Recruitment of Persons belonging to Scheduled caste sand Schedule Tribes

SI No.	Name of office	Name of category	No. of Persons recruited under the division	Posting Order No.

Satetment VIII.

List of Major works costing above 5 lakhs for which Administrative Sanction was accorded during YY-YY
(Circle wise)

Sl No.	Name of Work	Administrative Sanction order Number and date	Amount (Rs in Lakhs)

Satetment IX.

List of Major works costing above 5 lakhs for which Technical Sanction was accorded during YY-YY
(Circle wise)

Sl No.	Name of Work	Technical Sanction order Number and date	Amount (Rs in Lakhs)

Satetment IX.A

List of Major Electrical works costing above 5 lakhs for which Technical Sanction was accorded during YY-YY
(Circle wise)

Sl No.	Name of Work	Technical Sanction order Number and date	Amount (Rs in Lakhs)

Satetment X.

List of Works costing 5 lakhs and above for which investigation is completed in the year YY-YY
(Roads/ Buildings/ Bridges/ NH/ Projects)

Sl No.	Name of Division	Name of Work	Approximate Estimate Cost (Rs in Lakhs)

Satetment XI.

List of Works costing 5 lakhs and above for which investigation is in progress in the year YY-YY
(Roads/ Buildings/ Bridges// NH/ Projects)

Sl No.	Name of Division	Name of Work	Approximate Estimate Cost (Rs in Lakhs)

Satetment XII.

List of Permanent Buildings –Completed and worthwhile to be highlighted as notable achievements in the year YY-YY

Sl No.	Name of Work	Cost of Completion in Lakhs	Date of Completion	Plinth area of the building	Floor Area of the building	Implementing agency/ Contractor	Department/ Agencies for whom work was carried out

Satetment XII.A

Details of roads costing 5 Lakhs and above completed during YY-YY

(Length in Km)

Sl. No	Name of Division	Name of Road	Cost	Remarks

Satetment XII.B

Details of MLA roads completed during YY-YY

Sl. No	Name of Division	Name of Road	Length of road	Width of road	Cost	Remarks

Satetment XII.C

Details of Bridges costing 5 Lakhs and above completed during YY-YY

(Length in Km)

Sl. No	Name of Division	Name of Bridge	Cost	Remarks

Satetment XII.D

Category wise Length of roads newly constructed in each Division

(Length in Km)

Sl. No	Name of Division	State Highway	MDR	ODR	Village Roads	Total

Satetment XII.E

Details of roads transferred to/ converted to other department/ category in each Division during YY-YY

(Length in Km)

Sl. No	Name of Division	Name of Road	Length	Category	Transferred to/ Converted to	Order No.

Satetment XII.F

Details of roads taken over by PWD from other departments in each Division during YY-YY

(Length in Km)

Sl. No	Name of Department from which the road is transferred	Name of Road	Length in Km	Category of surface and Surface Width (m)	Category to which added and existing land width	Name of division taking charge and date	Order no.

Satetment XII.G

Category wise Length of National Highways newly constructed in each Division

(Length in Km)

Sl. No	Name of Division	National Highways	Total

Satetment XII.H

List of bridges and Building for which design was completed (in YY-YY)

Sl. No	Name of work (Building design)	Approximate cost

Satetment XII.I

List of bridges and Building for which design work ongoing (in YY-YY)

Sl. No	Name of work	Approximate cost

Satetment XII.J

List of bridges and Building for which Project Preparation was completed (in YY-YY)

Sl. No	Name of work (Building/ Bridge design)	Approximate cost

Satetment XII.K

List of bridges and Building for which design work ongoing (in YY-YY)

Sl. No	Name of work (Building/ Bridge design)	Approximate cost

Satetment XIII.

List of works costing 5 lakhs and above for which work is ongoing in the year YY-YY.

(Roads/ Bridges/ Buildings/ National Highways, Projects)

Name of Division	Sl No.	Name of work	Estimate Cost (Rs in Lakhs)

Satetment XIII.A

Electrical works costing above 5 Lakhs ongoing in the year YY-YY.

Sl No.	Name of Work	File No.	Estimate Cost (Rs in Lakhs)

Satetment XIV.

Number of government Buildings maintained in each division during YY-YY

Sl No.	Name of Division	Type of Government Building	Number	Plinth area of the building	Floor Area of the building	Remarks

Satetment XIV.A

Length of roads (Surface wise) maintained in each division during YY-YY

(Length in Km)

Sl. No	Name of Division	CC	BT	Metalled	Others	Total

Satetment XIV.B

Length of roads (Category wise) maintained in each division during YY-YY

(Length in Km)

Sl. No	Name of Division	State Highway	MDR	ODR	Village Roads	Total

Satetment XIV.C

Length of roads for which various surface treatments done in each division during YY-YY

(Length in Km)

Sl. No	Name of Division	Chipping Carpet	BM & AC	Surface treatments	others	Total

Satetment XIV.D

Length of roads given Surface treatment in each division (category wise) during YY-YY

(Length in Km)

Sl. No	Name of Division	State Highway	MDR	ODR	Village Roads	Total

Satetment XIV.E

Length of National highways, Surface wise, maintained in each division (category wise) during YY-YY

(Length in Km)

Sl. No	Name of Division	Name of National Highway	Chipping Carpet	BM & AC	Surface treatments	others	Total

Satetment XV.

Details of Vehicles, Tool and Plants and other Equipments

Sl No.	Name of Office	Item	Number	Remarks

Satetment XVI.

Statement of Plan Outlay of expenditure (Rs in Lakhs)

Sl No.	Head of Account	YY-YY (3 years previous)		YY-YY (2 years previous)		YY-YY (Previous Financial Year)		YY-YY Current Financial Year	
		Outlay	Expenditure	Outlay	Expenditure	Outlay	Expenditure	Outlay	Expenditure

Satetment XVII.

Statement of Financial Review Non Plan Schemes (Rs in Lakhs)

Sl No.	Head of Account	YY-YY (3 years previous)		YY-YY (2 years previous)		YY-YY (Previous Financial Year)		YY-YY Current Financial Year	
		Outlay	Expenditure	Outlay	Expenditure	Outlay	Expenditure	Outlay	Expenditure

Satetment XVIII.

Statement details of revenue anticipated and realised for the year YY -YY (Rs in Lakhs)

Sl No.	Head of Account	YY-YY (3 years previous)		YY-YY (2 years previous)		YY-YY (Previous Financial Year)		YY-YY Current Financial Year	
		Anticipated	Realised	Anticipated	Realised	Anticipated	Realised	Anticipated	Realised

Satetment XIX.

Statement details of Expenditure regarding TSP/SCP for the welfare of Scheduled caste and scheduled tribes

Sl No.	Head of Account	Expenditure During YY-YY (RS in Lakhs)

Satetment XX.

Statement showing details regarding the 50% and 100 % CSS works in TSP/SCP

Sl No.	Head of Account	Expenditure During YY-YY (RS in Lakhs)

Appendix 1100.1 Environmental Regulations (National, State and Local) Management

Sl No.	Name of Act/ Rule	Brief description	Implementing Agency
1.	<ul style="list-style-type: none"> • The Environmental Protection Act, 1986, and the Environmental Impact Assessment (EIA) Notification, 2006 	<p>This includes air, noise and water quality standards and the requirements for the preparation of Environmental Impact Assessment (EIA) statements for developmental projects. Expansion or modernization of any activity shall not be undertaken in any part of India unless it has been accorded environmental clearance by the Union Government, in accordance with the procedures specified in this notification. As per the procedure, anybody who desires to undertake any project is required to submit a detailed project report, which shall inter-alia include an Environmental Impact Assessment (EIA).</p> <p>As per the EIA Notification 2006, (i) new State highways and (ii) expansion of State highways greater than 30 km involving additional right of way greater than 20m involving land acquisition are classified as Category 'B' projects. Also, (i) buildings ≥ 20000 sq.mtrs and $< 1,50,000$ sq.mtrs. of built-up area and (ii) Townships and Area Development projects covering an area ≥ 50 ha and or built up area $\geq 1,50,000$ sq .mtrs are classified as Category 'B' projects.</p> <p>In these Category 'B' projects or activities, PWD have to submit an application seeking prior environmental clearance made in Form 1 to the concerned State level Expert Appraisal Committee (SEAC) for determining whether or not the project or activity requires further environmental studies such as the preparation of an Environmental Impact Assessment (EIA). If SEAC indicates that the project require an EIA report, then the project shall be classified as Category 'B1.' Otherwise, the project shall be termed Category 'B2' and will not require an EIA report.</p>	<p>Ministry of Environment & Forests</p> <p>Central Pollution Control Board</p> <p>Kerala Science Technology & Environment Department</p> <p>Kerala State Pollution Control Board</p>
2.	The Water and Air (Prevention and Control of Pollution) Acts of 1974 and 1981 (respectively)	Prevention and Control of Pollution, Setting and managing water quality and effluent standards, as well as monitoring water quality, prosecuting offenders and issuing licenses for establishment and operation of certain facilities. Empowered for conduct of public hearing of all projects including road	<p>Central Pollution Control Board</p> <p>Kerala State Pollution</p>

		projects.	Control Board
3.	The Public Liability Insurance Act, 1991	An Act to provide for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling any hazardous substance (defined under the Environment (Protection) Act 1986 and exceeding such quantity as may be specified by notification by the central Government.) and for matters connected therewith or incidental thereto.	Kerala State Pollution Control Board
4.	The National Environment Tribunal Act, 1995	An Act to provide for strict liability for damages arising out of any accident occurring while handling any hazardous substance and for the establishment of a National Environment Tribunal for effective and expeditious disposal of cases arising from such accident, with a view to giving relief and compensation for damages to persons, property and the environment and for matters connected therewith or incidental thereto.	Ministry of Environment & Forests
5.	The National Environment Appellate Authority Act, 1997	An Act to provide for the establishment of a National Environment Appellate Authority to hear appeals with respect to restriction of areas in which any industries, operations or processes or class of industries, operations or processes shall not be carried out or shall be carried out subject to certain safeguards under the Environment (Protection) Act, 1986 and for matters connected therewith or incidental thereto.	Ministry of Environment & Forests
6.	The Forest (Conservation) Act, 1980	The Forest (Conservation) Act, 1980 pertains to the cases of diversion of forest area and felling of roadside plantation. Depending on the size of the tract to be cleared, clearances are applied for at the following levels of government: Restrictions and clearance procedure proposed in the Forest (Conservation) Act applies wholly to the natural forest areas, even in case the protected/designated forest area does not have any vegetation cover.	
		Area of forests to be cleared or diverted exceeds 40ha (or, 10ha in hilly area)	Ministry of Environment and Forests
		Area of forest to be cleared or diverted is less than 40ha.	Chief Conservator of Forests or Conservator of Forests of the concerned Regional Office of the Ministry of Environment and Forests.

7.	The Wildlife (Protection) Act, 1972	Establish a number of National Parks and Sanctuaries, to protect and conserve the flora and fauna.	Ministry of Environment & Forests
8.	The Biological Diversity Act, 2002	An Act to provide for conservation of biological diversity, sustainable use of its components and fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and for matters connected therewith or incidental thereto. To develop national strategies, plans, programmes for the conservation and promotion and sustainable use of biological diversity including measures for identification and monitoring of areas rich in biological resources, promotion of in situ, and ex situ, conservation of biological resources, incentives for research, training and public education to increase awareness with respect to biodiversity.	Ministry of Environment & Forests
9.	Coastal Regulation Zone (CRZ) and Regulating Activities in CRZ. (Notification)	Coastal stretches of seas, bays, estuaries, creeks, rivers and backwaters which are influenced by tidal action (in the landward side) upto 500 metres from the High Tide Line (HTL) and the land between the Low Tide Line (LTL) and the HTL as Coastal Regulation Zone; and imposes restrictions on the setting up and expansion of industries including construction of infrastructure projects, operations or processes, etc. in the Coastal Regulation Zone (CRZ).	Ministry of Environment & Forests Kerala Science Technology & Environment Department
10.	The Motor Vehicles Act, 1988	Enforce standards for prevention and control of vehicular pollution . The authority also checks emission standards of registered vehicles, collects road taxes, and issues licenses Pollution Under Control Certificate (PUC) programme to control vehicular emissions.	State Transport Authority
11.	The Ancient Monuments , Archaeological Sites and Remains Act, 1958	According to this Act, area within radii of 100m and 300m from the “protected property” are designated as “protected area” and “controlled area” respectively. No development activity (including building, mining, excavating, blasting) is permitted in the “protected `area” and development activities likely to damage the protected property are not permitted in the “controlled area”.	1. Archaeological Survey of India (ASI) if the site/remains/ monuments are protected by ASI 2. State Department of Archaeology if these are protected by the State
12.	The Building and other Construction Workers (Regulation of Employment	All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay cess at rate not exceeding 2% of the cost of	The employer to whom the Act applies has to obtain a registration

	and Conditions of Service) Act 1996	construction as may be notified by the Government. The employer of the establishment is required to provide safety measures at the Building or Construction work and other welfare measures, such as Canteens, First-aid facilities, Ambulance, Housing accommodation for workers near the workplace etc..	certificate from the Registering Officer appointed by the Government
13.	Explosives Act, 1884 and Explosive Rules, 1983	An act, to regulate manufacture, possession, use, sale, transport, import and export of explosives.	Central Government (Department of Explosives)
14.	Petroleum Act, 1934 and Petroleum Rules, 2002	An Act to consolidate and amend the law relating to the import, transport, storage, production, refining and blending of petroleum.	Central Government
15.	The Mines and Minerals (Regulations and Development) Act, 1957 and rules there under	An Act and rules to provide for the regulation of mines and the development of minerals to be followed for the extraction of the sand and aggregates through mining.	State Government

Appendix 1100.2 Standard EMP for Projects / Works

S. No.	Environmental Issue	Management Measures
A. INITIAL JOINT VERIFICATION		
W.A.1	Initial Joint Field Verification for modifying contract documents	The PWD and the Contractor will carry out joint field verification to ascertain the possibility to saving trees, environmental and community resources. The verification exercise should assess the need for additional protection measures or changes in design/scale/nature of protection measures including the efficacy of enhancement measures suggested in the EMP. Proper documentation and justifications/reasons shall be maintained in all such cases where deviation from the original EMP is proposed.
W.A.2	Relocation of Community Utilities & Common Property	All community utilities and properties i.e., water supply lines, sewer lines, bank buildings, health centers, schools, health clinics and veterinary hospitals will be relocated before construction starts, on any section of the project corridor. The PWD will relocate these properties in consultation and written agreement with the agency/ owner/community. The schools and health centers will be constructed as per the relevant state

S. No.	Environmental Issue	Management Measures
	Resources.	<p>norms.</p> <p>All other community property resources within the corridor of impact such as hand pumps, ponds, grazing lands etc. will be relocated.</p> <p>The relocation sites for these schools will be identified in accordance with the choice of the community. Environmental considerations with suitable/required actions including health and hygiene aspects will be kept in mind while relocating all community utilities and resources.</p> <p>All religious property resources such as shrines, temples and mosques within the project zone will be relocated.</p> <p>Sites for the relocation of these religious structures will be identified in accordance with the choice of the community. The NGO and PWD in consultation with local people will finalize design of these temples. As far as possible, the architectural elements of the structure should be conserved/reflected/translated into the design of new structures.</p> <p>The entire process (i.e. selection of relocation sites and designs) will be under supervision of the PWD. The relocation will be completed before the construction starts in these sites.</p>
W.A.3	Cultural properties	<p>The contractor shall take necessary care to ensure no impact on cultural properties such as (i) historic sites and remains, (ii) places of worship including temples, mosques, churches and shrines, (iii) graveyards and monuments and other important structures as identified during the design.</p> <p>As per design, if there are works that impact these cultural properties, the contractor shall execute the works in close co-ordination with the PWD and the local community.</p>
B. FLORA & FAUNA		
W.B.1	Preservation of Trees	<p>All efforts will be made to preserve trees including evaluation of minor design adjustments/alternatives (as applicable) to save trees. Specific attention will be given for protecting giant trees, green tunnels and locally important trees (religiously important etc.).</p> <p>Tree cutting is to proceed only after all the legal requirements including attaining of In-principle and Formal Clearances from the Forest Dept./DoEF/MoEF are completed and subsequently a written order is issued to the Contractor.</p> <p>Particular species declared as 'protected' by the State's Forest Dept. in the private land will be felled only after due clearance from the Forest Dept. is obtained.</p>

S. No.	Environmental Issue	Management Measures
		In the event of design changes, additional assessments including the possibility to save trees shall be made. Stacking, transport and storage of the wood will be done as per the relevant norms. Systematic corridor level documentation for the trees cut and those saved will be maintained by the PWD. The contractor will adhere to the separate PWD Guidance on landscaping and tree species.
W.B.2	Compensatory Plantation	The contractor will undertake compensatory plantation for every tree cut. The plantation will be at least 2 trees planted for every tree cut. The contractor will do the plantation along the ROW wherever feasible. Minimum 80 percent survival rate of the saplings will be acceptable otherwise the contractor will replace dead plants at his own cost. The contractor will maintain the plantation till they handover the project site to PWD. The PWD will inspect regularly the survival rate of the plants and compliance to agreed plans.
W.B.3	Clearing and Grubbing	Vegetation will be removed from the construction zone before commencement of construction. All works will be carried out such that the damage or disruption to flora other than those identified for cutting is minimal. Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works will be removed with prior approval from the PWD. The contractor, under any circumstances will not cut or damage trees. Trees identified under the project will be cut only after receiving clearance from the Forest Dept./DoEF/MoEF (as applicable) and after the receipt of PWD's written permission in this regard. Vegetation only with girth of over 30 cm will be considered as trees and shall be compensated, in the event of PWD's instruction to undertake tree cutting.
W.B.4	Fauna and wildlife	The contractor shall ensure that none of its workers adversely affect any fauna or wildlife. Hunting will be strictly prohibited.
C. BORROW AREAS & QUARRIES		
W.C.1	Borrow Areas	Finalizing borrow areas for borrowing earth and all logistic arrangements as well as compliance to environmental requirements, as applicable, will be the sole responsibility of the contractor. The Contractor will not start borrowing earth from select borrow area until the formal agreement is signed between land owner and contractor and a copy is submitted to the PWD.

S. No.	Environmental Issue	Management Measures
		<p>Locations finalized by the contractor shall be reported to the PWD and who will in turn report to PWD. Format for reporting will be as per the Reporting Format for Borrow Area and will include a reference map. Planning of haul roads for accessing borrow materials will be undertaken during this stage. The haul roads shall be routed to avoid agricultural areas as far as possible and will use the existing village roads wherever available.</p> <p>In addition to testing for the quality of borrow materials, the PWD will be required to inspect every borrow area location prior to approval (follow criteria for evaluation of borrow areas). Contractor shall adhere to the separate Guidelines on Borrow area management.</p>
W.C.2	Quarrying	<p>Contractor shall acquire material only from approved and licensed quarries. If contractor intends to develop a new quarry, then all the approvals and licenses must be obtained prior to withdrawing material from the quarry. Contractor shall adhere to the separate Guidelines on quarry management.</p>
D. CONSTRUCTION CAMP		
W.D.1	Arrangements for Temporary Land Requirement	<p>The contractor as per prevalent rules will carry out negotiations with the landowners for obtaining their consent for temporary use of lands for construction sites/hot mix plants/traffic detours/borrow areas etc. The PWD will be required to ensure that the clearing up of the site prior to handing over to the owner (after construction or completion of the activity) is included in the contract.</p>
W.D. 2	Crushers, hot-mix plants and Batching Plants Location	<p>Hot mix plants and batching plants will be sited sufficiently away from settlements and agricultural operations or any commercial establishments. Such plants will be located at least 150 m away from the nearest village/settlement preferably in the downwind direction.</p> <p>The Contractor shall submit a detailed lay-out plan for all such sites and approval of PWD shall be necessary prior to their establishment.</p> <p>Arrangements to control dust pollution through provision of wind screens, sprinklers, dust encapsulation will have to be provided at all such sites.</p> <p>Specifications of crushers, hot mix plants and batching plants will comply with the requirements of the relevant current emission control legislations and Consent/NOC for all such plants shall be submitted to the PWD.</p> <p>The Contractor shall not initiate plant/s operation till the required legal clearances are obtained and submitted.</p>

S. No.	Environmental Issue	Management Measures
W.D.3	Other Construction Vehicles, Equipment and Machinery	<p>All vehicles, equipment and machinery to be procured for construction will confirm to the relevant Bureau of India Standard (BIS) norms. The discharge standards promulgated under the Environment Protection Act, 1986 will be strictly adhered to.</p> <p>Noise limits for construction equipments to be procured such as compactors, rollers, front loaders concrete mixers, cranes (moveable), vibrators and saws will not exceed 75 dB (A), measured at one meter from the edge of the equipment in free field, as specified in the Environment (Protection) Rules, 1986.</p> <p>The Contractor shall maintain a record of PUC for all vehicles and machinery used during the contract period.</p>
W.D.4	Arrangement for Construction Water	<p>The contractor will use ground water as a source of water for the construction and will set up the own bore well facility for construction work.</p> <p>Contractor can use the ponds, which are not in use by community or identified to fill up for the project, but in that case, before using any pond water contractor will obtain written consent from the owner and submit to PWD.</p> <p>To avoid disruption/disturbance to other water users, the contractor will extract water from fixed locations and consult the PWD before finalizing the locations.</p> <p>The Contractor will provide a list of locations and type of sources from where water for construction will be used.</p> <p>The contractor will not be allowed to pump from any irrigation canal and surface water bodies used by community.</p> <p>The contractor will need to comply with the requirements of the State Ground Water Department and seek their approval for doing so and submit copies of the permission to PWD prior to initiating the works.</p> <p>Contractor will arrange adequate supply and storage of water for the whole construction period at his own costs. The Contractor will submit a list of source/s from where water will be used for the project to PWD.</p> <p>The contractor will take all precaution to minimize the wastage of water in the construction process/ operation.</p>
W.D.5	Potable water for labour	<p>The Contractor will also provide potable water facilities within the precincts of every workplace in an accessible place, as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996.</p> <p>The contractor will also guarantee the supply of sufficient quantity of potable water (as per IS) in every</p>

S. No.	Environmental Issue	Management Measures
		workplace/labor camp site at suitable and easily accessible places and regular maintenance of such facilities.
E. CONSTRUCTION WASTES		
W.E.1	Generation of Debris from dismantling structures and road surface	<p>Debris generated due to the dismantling of the existing road will be suitably reused in the proposed construction, subject to the suitability of the materials and approval of the PWD as follows:</p> <p>The sub grade of the existing pavement shall be used as embankment fill material.</p> <p>The existing base and sub-base material shall be recycled as sub-base of the haul road or access roads</p> <p>The existing bitumen surface may be utilized for the paving of cross roads, access roads and paving works in construction sites and campus, temporary traffic diversions, haulage routes etc.</p> <p>The contractor will suitably dispose off unutilized debris materials either through filling up of borrow areas located in wasteland or at pre-designated disposal locations, subject to the approval of the PWD.</p> <p>At locations identified for disposal of residual bituminous wastes, the disposal will be carried out over a 60 mm thick layer of rammed clay so as to eliminate the possibility of leaching of wastes into the ground water. The contractor will ensure that the surface area of such disposal pits is covered with a layer of soil.</p> <p>All arrangements for transportation during construction including provision, maintenance, dismantling and clearing debris, will be considered incidental to the work and will be planned and implemented by the contractor as approved and directed by the PWD.</p> <p>The pre-designed disposal locations will be a part of Comprehensive Solid Waste Management Plan to be prepared by Contractor in consultation and with approval of PWD.</p> <p>Debris generated from pile driving or other construction activities shall be disposed such that it does not flow into the surface water bodies or form mud puddles in the area.</p> <p>The contractor shall identify dumping sites. The identified locations will be reported to the PWD. These locations will be checked on site and accordingly approved by PWD prior to any disposal of waste materials.</p>

S. No.	Environmental Issue	Management Measures
W.E.2	Other Construction Wastes Disposal	<p>The pre-identified disposal locations will be a part of Waste Disposal to be prepared by the Contractor in consultation and with approval of PWD. Location of disposal sites will be finalized prior to completion of the earthworks on any particular section of the road.</p> <p>The PWD will approve these disposal sites after conducting a joint inspection on the site with the Contractor.</p> <p>Contractor will ensure that any spoils of material unsuitable for embankment fill will not be disposed off near any water course, agricultural land, and natural habitat like grass lands or pastures. Such spoils from excavation can be used to reclaim borrow pits and low-lying areas located in barren lands along the project corridors (is so desired by the owner/community). All waste materials will be completely disposed and the site will be fully cleaned and certified by PWD before handing over.</p> <p>The contractor at its cost shall resolve any claim, arising out of waste disposal or any non-compliance that may arise on account of lack of action on his part.</p>
F. SOIL & DRAINAGE		
W.F.1	Stripping, stocking and preservation of top soil	<p>The top soil from all areas of cutting and all areas to be permanently covered will be stripped to a specified depth of 150 mm and stored in stockpiles. A portion of the temporarily acquired area and/or Right of Way will be earmarked for storing topsoil. The locations for stock piling will be pre-identified in consultation and with approval of PWD. The following precautionary measures will be taken to preserve them till they are used:</p> <p>(a) Stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and height of the pile is restricted to 2 m. To retain soil and to allow percolation of water, the edges of the pile will be protected by silt fencing.</p> <p>(b) Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur. The stockpiles shall be covered with gunny bags or vegetation.</p> <p>(c) It will be ensured by the contractor that the top soil will not be unnecessarily trafficked either before stripping or when in stockpiles.</p> <p>Such stockpiled topsoil will be utilized for -</p> <ul style="list-style-type: none"> • Covering all disturbed areas including borrow areas (not those in barren areas) • Top dressing of the road embankment and fill slopes

S. No.	Environmental Issue	Management Measures
		<ul style="list-style-type: none"> • Filling up of tree pits, in the median and • In the agricultural fields of farmers, acquired temporarily. Residual topsoil, if there is any will be utilized for the plantation at median and side of the main carriageway.
W.F.2	Landslides	Along landslide prone areas in hilly terrain, the slopes need to be stabilised. As drainage is most critical at these locations, proper drainage needs to be constructed at these locations.
W.F.3	Drainage and Flood Control	<p>Contractor will ensure that no construction materials like earth, stone, ash or appendage disposed off so as not to block the flow of water of any water course and cross drainage channels.</p> <p>Contractor will take all necessary measures to prevent the blockage of water flow. In addition to the design requirements, the contractor will take all required measures as directed by the PWD to prevent temporary or permanent flooding of the site or any adjacent area.</p> <p>Proper drainage should be arranged in the construction camps.</p>
G. WATER BODIES & WATER POLLUTION		
W.G.1	Siltation of Water Bodies and Degradation of Water Quality	<p>The Contractor will not excavate beds of any stream/canals/ any other water body for borrowing earth for embankment construction.</p> <p>Contractor will construct silt fencing at the base of the embankment construction for the entire perimeter of any water body (including wells) adjacent to the RoW and around the stockpiles at the construction sites close to water bodies. The fencing will be provided prior to commencement of earthwork and continue till the stabilization of the embankment slopes, on the particular sub-section of the road.</p> <p>The contractor will also put up sedimentation cum grease traps at the outer mouth of the drains located in truck lay byes and bus bays which are ultimately entering into any surface water bodies / water channels with a fall exceeding 1.5 m.</p> <p>Contractor will ensure that construction materials containing fine particles are stored in an enclosure such that sediment-laden water does not drain into nearby water course.</p>
W.G.2	Water Pollution from Construction Wastes, Fuel & Lubricants	<p>The Contractor will take all precautionary measures to prevent the wastewater generated during construction from entering into streams, water bodies or the irrigation system. Contractor will avoid construction works close to the streams or water bodies during monsoon.</p> <p>All waste arising from the project is to be disposed off in the manner that is acceptable to the KSPCB.</p>

S. No.	Environmental Issue	Management Measures
		<p>The PWD will certify that all liquid wastes disposed off from the sites meet the discharge standards. The contractor will ensure that all construction vehicle parking location, fuel/lubricants storage sites, vehicle, machinery and equipment maintenance and refueling sites will be located at least 500 m from rivers and irrigation canal/ponds.</p> <p>A minimum distance of any sewage or toilet facility will be 200m from the water course.</p> <p>All location and lay-out plans of such sites will be submitted by the Contractor prior to their establishment and will be approved by the PWD.</p> <p>Contractor will ensure that all vehicle/machinery and equipment operation, maintenance and refueling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Oil interceptors will be provided for vehicle parking, wash down and refueling areas as per the design provided. In all, fuel storage and refueling areas, if located on agricultural land or areas supporting vegetation, the top soil will be stripped, stockpiled and returned after cessation of such storage.</p> <p>Contractor will arrange for collection, storing and disposal of oily wastes to the pre-identified disposal sites (list to be submitted to PWD) and approved by the PWD. All spills and collected petroleum products will be disposed off in accordance with MoEF and state PCB guidelines.</p> <p>PWD will certify that all arrangements comply with the guidelines of PCB/ MoEF or any other relevant laws.</p>
H AIR POLLUTION		
W.H.1	Dust Pollution	<p>All vehicles delivering materials to the site shall be adequately covered.</p> <p>The contractor will take every precaution to reduce the level of dust emissions from crushers/hot mix plants/batching plant/WMM plant, construction sites involving earthwork by sprinkling of water, encapsulation of dust source and by erection of screen/barriers.</p> <p>The contractor shall obtain the necessary consent-to-establish and consent-to-operate for all its plants from the KSPCB.</p> <p>All the plants will be sited at least 150m in the downwind direction from the nearest human settlement.</p> <p>The contractor will provide necessary monitoring reports to confirm that all plants conform to relevant dust emission control legislation. The suspended particulate matter value at a distance of 40m from a unit located in a cluster should be less than 500 g/m³. The contractor shall conduct pollution monitoring at periodic</p>

S. No.	Environmental Issue	Management Measures
		intervals. Dust screening vegetation will be planted on the edge of the RoW for all existing roadside crushers. Hot mix plant will be fitted with dust extraction units.
W.H.2	Air Emission from Construction Vehicles, Equipment and Machineries	Contractor will ensure that all vehicles, equipment and machinery used for construction are regularly maintained and confirm that pollution emission levels comply with the relevant requirements of PCB. The Contractor will submit PUC certificates for all vehicles/ equipment/machinery used for the project. Monitoring results will also be submitted to PWD as per the monitoring plan.

S. No.	Environmental Aspect/Issue	Management Measures

I. NOISE		
W.I.1	Noise Pollution: Noise from Vehicles, Plants and Equipments	<p>The Contractor will confirm the following:</p> <p>All plants and equipment used in construction shall strictly conform to the MoEF/CPCB noise standards. All vehicles and equipment used in construction will be fitted with exhaust silencers. Servicing of all construction vehicles and machinery will be done regularly and during routine servicing operations, the effectiveness of exhaust silencers will be checked and if found defective will be replaced. Limits for construction equipment used in the project such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB (A) (measured at one meter from the edge of equipment in the free field), as specified in the Environment (Protection) rules, 1986. Maintenance of vehicles, equipment and machinery shall be regular and up to the satisfaction of the PWD to keep noise levels at the minimum. At the construction sites within 150 m of the nearest habitation, noisy construction work such as crushing, concrete mixing, batching will be stopped during the night time between 9.00 pm to 6.00 am.</p>

S. No.	Environmental Aspect/Issue	Management Measures
		<p>No noisy construction activities will be done around educational institutes/health centers (silence zones) up to a distance of 100 m from the sensitive receptors i.e., school, health centers and hospital.</p> <p>Contractor will provide noise barriers (Design of Noise Barrier Provided) to the suggested locations of select schools/ health centers. List of locations for noise barriers is given in specific EMP.</p> <p>Monitoring shall be carried out at the construction sites as per the monitoring schedule and results will be submitted to PWD. PWD will be required to inspect regularly to ensure the compliance of EMP.</p> <p>Workers in the vicinity of loud noise, and workers working with or in crushing, compaction or concrete mixing operations shall be provided necessary PPE such as ear plugs and ear muffs.</p>
J. TRANSPORTING MATERIALS		
W.J.1	Transporting Construction Materials and Haul Road Management	<p>Contractor will maintain all roads (existing or built for the project), which are used for transporting construction materials, equipment and machineries. All vehicles delivering fine materials to the site will be covered to avoid spillage of materials.</p> <p>All existing highways and roads used by vehicles of the contractor or any of his sub-contractor or suppliers of materials and similarly roads, which are part of the works, will be kept clear of all dust/mud or other extraneous materials dropped by such vehicles.</p> <p>Contractor will arrange for regular water sprinkling as necessary for dust suppression of all such roads and surfaces.</p> <p>The unloading of materials at construction sites in/close to settlements will be restricted to daytime only.</p>
K. TRAFFIC MANAGEMENT		
W.K.1	Accessibility	<p>The contractor will provide safe and convenient passage for vehicles, pedestrians and livestock to and from roadsides and property accesses connecting the project road, providing temporary connecting road.</p> <p>The contractor will also ensure that the existing accesses will not be undertaken without providing adequate provisions and to the prior satisfaction of PWD.</p> <p>The contractor will take care that the cross roads are constructed in such a sequence that construction work over the adjacent cross roads are taken up one after one so that traffic movement in any given area not get affected much.</p>

S. No.	Environmental Aspect/Issue	Management Measures
W.K.2	Planning for Traffic Diversions and Detours	<p>Temporary diversions will be constructed with the approval of the PWD.</p> <p>Detailed Traffic Control Plans will be prepared and submitted to the PWD for approval, five days prior to commencement of works on any section of road. The traffic control plans shall contain details of temporary diversions, traffic safety arrangements for construction under traffic, details of traffic arrangement after cessation of work each day, safety measures undertaken for transport of hazardous materials and arrangement of flagmen.</p> <p>The contractor will provide specific measures for safety of pedestrians and workers at night as a part of traffic control plans. The contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow.</p> <p>The contractor will also inform local community of changes to traffic routes, conditions and pedestrian access arrangements with assistance from PWD. The temporary traffic detours will be kept free of dust by sprinkling of water three times a day and as required under specific conditions (depending on weather conditions, construction in the settlement areas and volume of traffic).</p>
W.K.3	Traffic and Safety, Informatory Signs and Hoardings	<p>The contractor will take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as proposed in the Traffic Control Plan/Drawings and as required by the PWD for the information and protection of traffic approaching or passing through the section of any existing cross roads.</p> <p>The contractor will ensure that all signs, barricades, pavement markings are provided as per the MoRTH specifications. Before taking up of construction on any section of the existing lanes of the highway, a Traffic Control Plan will be devised and implemented to the satisfaction of the PWD.</p> <p>The contractor will provide, erect and maintain informatory/safety signs, hoardings written in English and local language, wherever required or as suggested by the PWD.</p>
L. LABOUR		
W.L.1	Labor Requirements	The contractor preferably will use unskilled labor drawn from local communities to give the maximum benefit to the local community.
W.L.2	Personal Safety Measures for	<p>Contractor will provide:</p> <ul style="list-style-type: none"> • Protective footwear and protective goggles to all workers employed on mixing asphalt materials,

S. No.	Environmental Aspect/Issue	Management Measures
	Labour	<p>cement, and lime mortars, concrete etc.</p> <ul style="list-style-type: none"> • Welder's protective eye-shields to workers who are engaged in welding works • Protective goggles and clothing to workers engaged in Factories Act, 1948 stone breaking activities and workers will be seated at sufficiently safe intervals • Earplugs to workers exposed to loud noise, and workers working in crushing, compaction, or concrete mixing operation. • High visibility overalls particularly when working along the ROW. • Hard hats / helmets when working with materials at heights or working inside trenches. <p>Adequate safety measures for workers during handling of materials at site are taken up. The contractor will comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress. The contractor will comply with all the precautions as required for ensuring the safety of the workmen as per the International Labor Organization (ILO) Convention No. 62 as far as those are applicable to this contract. The contractor will make sure that during the construction work all relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 are adhered to. The contractor will not employ any person below the age of 14 years for any work and no woman will be employed on the work of painting with products containing lead in any form. The contractor will also ensure that no paint containing lead or lead products is used except in the form of paste or readymade paint. Contractor will provide facemasks for use to the workers when paint is applied in the form of spray or a surface having lead paint dry is rubbed and scrapped. The Contractor will mark 'hard hat' and 'no smoking' and other 'high risk' areas and enforce non-compliance of use of PPE with zero tolerance. These will be reflected in the Construction Safety Plan to be prepared by the Contractor during mobilization and will be approved by PWD.</p>
W.L.3	First Aid	The contractor will arrange for:

S. No.	Environmental Aspect/Issue	Management Measures
		<ul style="list-style-type: none"> • A readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone • Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital • Equipment and trained nursing staff at construction camp.
M. MISCELLANEOUS		
W.M.1	Risk Force Majeure	<p>The contractor will take all reasonable precautions to prevent danger to the workers and public from fire, flood etc. resulting due to construction activities.</p> <p>The contractor will make required arrangements so that in case of any mishap all necessary steps can be taken for prompt first aid treatment. Construction Safety Plan prepared by the Contractor will identify necessary actions in the event of an emergency.</p>

App 1100.3 Guidance on Oxbow Lands

7.1 General

In rural areas with the realignment of roads, land acquisition is required and “Oxbow” lands can result from this process. This is the land in between the existing road and the new alignment. The Government of Kerala owns the land and the PWD Chief Engineer have delegated authority to use and manage this land in the public interest.

This land can be an opportunity to provide benefits for the road corridor and the community. Oxbow lands can vary in length ranging from a few metres to a few kilometers with a variable width of a few metres, which is unlikely to exceed 20 metres. As land is scarce in Kerala, the remaining Oxbow lands provide an opportunity for public and private investment to ultimately provide public benefit.

Each parcel of land will differ in size and context and the area suitable for only certain types of activities. A preliminary needs analysis should be undertaken initially to identify and establish the feasibility of options. A detailed plan can then be prepared.

7.2 Land Use Options

Options for the use of these lands could include:

- **Traffic and transport related infrastructure** - such as vehicle parking bays, lay bays, safety billboards, bus bays, taxi ranks, bus shelters.
- **Compensatory habitat** - to replace trees that may have been removed during construction.
- **Rest Area Facilities** primarily for travelers and include basic facilities such as seating, play area, signage and information.
- **Comfort stops** – these could be larger facilities to provide for recreation, rest, toilet and food facilities.
- **Commercial Facilities.** These would be for primary use by commercial travelers and include petrol.
- **Local Parkland, Sport and Recreation and Entertainment** spaces.
- **Visual Amenity Improvement** - by providing seating, landscaping, lighting, community art and signage.
- **Public utility** purposes including Waste management facilities for collection.
- **Tourism related activities** - such as interpretation centres.
- **Expand or complement** existing adjoining property activities.

7.3 Key Issues and Opportunities

- **Potential Income Generation:** There is potential to generate economic benefit for PWD through the lease, use or disposal of the land. The local municipality may also have an interest in the land for purchase or lease.
- **Capital Expenditure:** The type of facilities provided will require capital investment. Options to share in costs or for generating income to provide facilities should be explored with relevant authorities and non-government organisations.

- **Maintenance Costs:** Depending upon the type of activity and the land tenure, the areas may require ongoing expenditure for maintenance by PWD. Self financing options or income generating activities should be explored where appropriate.
- **Liaison with other Stakeholders:** Consultation with the relevant stakeholders would assist in the decision-making process for the planning, design and operation of the land. This includes community representatives, concerned authorities such as the panchayet and non-government organizations.
- **Encroachments:** Signs should clearly state the use of the site and the penalties for encroachment. Encroachment enforcement should be carried out as per the Kerala Highway Protection Act, 1999.

7.4 Guidelines

The development and use of this land should be considered by PWD in road planning, design, construction and operation phases.

7.4.1 Stage 1: Planning and Site Analysis: Prepare a Concept Plan(s)

Each oxbow land area is to be considered on its merit. A **Concept Plan** should be prepared at the same time as planning for the overall road project. Each site should be assessed before a detailed design is prepared. The Concept Plan can show:

- Environmental characteristics of the land including its topography and significant vegetation or environmental values that should be retained.
- Social characteristics of the land including any cultural values associated with the land, the need for community facilities and services in that specific location.
- The relationship of the area land to adjoining areas and the type of uses adjoining the area.
- The size of the land.
- Access control and sight distance.

Consider other factors in developing options.

- The size of the area and the demand or need for rest stops or facilities in the area identified (*Refer: Tables 1 and 2*).
- The need to provide compensatory habitat as a result of the road works.
- Any impact on personal or property safety for any activities proposed on the site.
- The need for tourism facilities, rest stops, local facilities such as parking, bus shelters and laybys.
- Funding Sustainability.

This process will assist in deciding the best type of use for the site and the task can be assigned by an assistant engineer with appropriate training.

Stage 2: Analysis

Based on the information from Stage 1, identify a range options for the use of the area. Identify Criteria and weight the criteria according to their importance to the area and the outcomes to be achieved. Each option can then be evaluated against the specified criteria to select a preferred option. Criteria can include:

- Road Safety

- Pedestrian Amenity
- Public transport use
- Transport efficiency
- Land use/resource efficiency
- Cultural and Social Values
- Environmental Values
- Viability Sustainable funding or ongoing income generating economic returns.

Stage 3: Design and Implementation:

Prepare detailed design for the selected option on a **Site plan/Landscape Plan/Strip Plan** for the area.

7.4.2 Stage 4: Specific Design Guidelines

Species should be planted in accordance with the Guidance for Landscaping Species unless the land is used for agricultural purposes.

Buildings and structures must comply with relevant IRC Codes, building specifications or relevant policies.

Safe access and egress should be provided generally using the existing road, which may require reconfiguration to enhance safety.

Any proposal for facilities will require the preparation of a **Planning Report**, which considers the implications of the proposal and also a site map this should include the following:

- Type of facilities, proposed operation of building, hours of operation
- Elevation and orientation of the proposed buildings
- A dimensioned plan showing the floor space area, height and relationship to existing buildings
- Location and number of parking spaces
- Pedestrian access
- Signage
- Waste disposal facilities
- Lighting
- Utility connections
- Landscaping details
- Environmental and Social improvements

Table 1: Typical type of Infrastructure and size for use of oxbow lands

	Type of Facility	Average Size - Rural	Average Size - Urban	Infrastructure
1	Rest Area	300m	100m	Seating, tables, lighting, signage, play equipment for children, fencing, landscaping, community cultural feature, information display boards, garbage bins, parking, bus shelter, layby
2	Comfort Stop	500m	N/A	All of the above including, potable water, restaurants, limited retail facilities, toilets.
3	Commercial	500m	400m	Service centres such as petrol stations, truck stops
4	Tourist Places	50m		Seating, parking
3	Other Uses			Planting, utility services, stockpile, weighbridges, public uses, limited retail uses, parkland

Table 2: Spacing or Distance between Facilities

	Type of Facility	
1	Rest Area	One every 50 km in rural areas
2	Comfort Stop	One every 70 km in rural areas
3	Commercial	One every 100km in rural areas
4	Tourist Places	As required
5	Other Uses	Merits of the Site

App 1100.4.Guidance on Quarry and Borrow Area Management

7.5 Purpose

To avoid and manage the impact of activities associated with quarry and borrow areas on the environment and affected community.

Some of the impacts of borrow areas and quarrying activities can include:

- Rock blasting can create air and noise pollution and vibration.
- Transport of material in trucks along roadways may create air and noise pollution.
- Excavated areas can provide places for water to pond and stagnate giving rise to the breeding of mosquitoes and the spread of malaria and other mosquito borne diseases.
- Excavation can affect the natural beauty of the landscape along the road through the removal of vegetation.
- Changes to the natural drainage pattern of the area.
- Loss of agricultural/productive soils especially paddy field areas due to borrow areas/Quarry.
- Digging of borrow areas within and along the proposed roadway.
- Improper management of the quarry/borrow area top soil.
- Over quarrying shall be avoided because of adverse impact on the ecology

These activities can have an affect on ecologically sensitive areas, the visual appearance of an area and also impact on the health and wellbeing of communities living nearby. Management measures should be used to avoid and minimize any impacts from quarry related activities.

The guidelines seek to ensure that the contractors and subcontractors:

- comply with the regulatory requirements in force at the time
- reasonably manage any impacts.
- reinstate and rehabilitate the land appropriately.
- consult with the affected community. Reference should also be made to the *Policy Guidelines for Public Hearing*.

7.6 Guidelines

All works to be undertaken in accordance with relevant rules and legislation including IRC guidelines and MORT&H specification (e.g. clauses 111.2, 111.3, 305.2.2.2 and 305.3.3).

Quarry activities cannot commence until consent has been given in writing by the Forest Department or other concerned authorities.

The Contractor will provide the Employer/Engineer with details of the location, size and shape of borrow areas/quarry areas for written approval prior to opening the area.

Where specific borrow areas are not designated by the Employer/the Engineer, the Contractor will be solely responsible for ensuring that the source of supply of material for embankment and subgrade is carried out in accordance with environmental requirements for excavation and borrow areas as stipulated, from time to time by the Ministry of Environment and Forests, Government of India and the local bodies, as applicable.

Topsoil shall not be unnecessarily trafficked either before stripping or when in a stockpile. Stockpiles shall not be surcharged or otherwise loaded and multiple handling shall be kept to a minimum.

Following excavation, the sides of excavated area shall be trimmed and the area contoured to minimize erosion, subsidence and pounding, allowing for natural drainage to take place.

If trees were removed, new trees shall be planted, as directed by the Engineer. Additional borrow pits should not be opened without the restoration of those areas no longer in use.

Borrow areas are not permitted to be located in the paddy fields or other agricultural areas.

The contractor is to prepare a Borrow and Quarry Area Management Plan and include the following details:

- Name.
- Location.
- Size of the Quarry or Borrow area.
- Ownership of the borrow or Quarry area. Whether purchased or leased. Include a signed statement of approval from the owner giving approval for the works.
- State the proposed Activities including:
 - Approximate quantity and type of the material available.
 - Approximate depth of excavation required to obtain the material.
 - Whether the depth and cut slope are as per IRC guidelines?
 - The number, species type, location and maturity of trees to be removed.
 - Quantities of top soil removed.
 - Location of storage of top soil.
 - Estimated daily truck movements.
- Existing land use of the area (including the access road to be developed) to be quarried.
- The relationship to adjoining areas including whether it is located near to ecologically sensitive area, proximity to residential areas? Specify the nature and approximate distance from the proposed quarry or borrow area.
- Include details of the safety precautions to be used during quarry operation to protect workers, the environment and the public.
- Proposed plan for the reuse of top soil.
- Methods used to reduce air (e.g. dust from trucks) and noise pollution during operation.
- Methods for the proper drainage of water.
- Offset from the TOE of the Roadway.
- Distance from the adjacent borrow area.
- A Restoration Plan indicating the location, type and number of trees that will be planted, the method to rehabilitate the access road, the landscaping plans for the borrow or quarry area and the maintenance program that will be implemented to ensure the proposed works are properly maintained following completion of the project.
- The action plan for leveling and landscaping in order to bring the area in conformity to the neighbouring land uses.
- The quality of the proposed borrow materials shall be determined and approved prior to use.

Format 1

7.7 BORROW AREAS IDENTIFICATION

(To be completed by the Contractor)

Pre-Construction Stage Report-Date Month Year... .

Site Layout of Borrow Area and Proposed Borrow Area Rehabilitation Plan are required to be attached with format. Format to be submitted before target date as (decided by PWD) for establishing Quarries Area No. BA.

Location of Borrow Area (KM)(RHS/LHS) Package

SL. No.	ITEM	UNIT	DETAILS	REMARKS
1	Date of Borrow Area becoming Operational dd/mm/yy			
2	Current Land use			
3	No of settlements within 500m of Borrow Area	nos		
4	Distance from the ecologically sensitive area	km		
5	Offset from the ROW	m		
6	Total Capacity	cum		
7	No of Trees with girth more than 0.3 cms	nos		
8	Details of the plan for re-plantation			
9	Length of Haul Road	km		
10	Width of Haul road	m		
11	Type of Haul Road	metal/dirt .		
12	No of settlements within 200m of Haul Road	nos		
13	Size of Borrow Area	sqkm		
14	Area of Borrow Area	kmxkm		
15	Depth of Borrow area	m		
16	Cut slope as specifications	Yes/No		
17	Quantity Available	cum		
18	Dist of Nearest Water Source	Type / Size/ Capacity/ Present Use/ Ownership		
19	Quantity of top soil removed	cum		
20	Details of storage of topsoil			
21	Details of the plan for the reuse of top soil			
22	Details of the arrangement for proper drainage.			

Certified that the furnished information is correct and all relevant information as required is attached.

Contractor _____

PWD Engineer

Format 2

QUARRY SOURCE IDENTIFICATION

(To be completed by the Contractor)

Pre-Construction Stage Report-Date... .. Month Year... ..

Site Layout of Quarry and Proposed Quarry Re-habilitation Plan to be attached with format.
Format to be submitted before target date quarries as (decided by the PWD) for establishing
Quarry No.Q

Location of Quarry (Km) (RHS/LHS) Package

SL. No	ITEM	UNIT	DETAILS	REMARKS
1	Location	Ch		
2	Distance from ecologically sensitive area	km		
3	License no			
4	License Valid till	Date		
5	Size of Quarry	mxm		
6	Quantity Available	Cum		
7	Proposed depth	m		
8	Total Capacity	Cum		
9	No of Settlements within 500m of Quarry	Nos		
10	Width of Haul road	M		
11	Type of Haul Road	Metalled/dirt		
12	Length of Haul Road	Sqkm		
13	No of Settlements within 500m of Haul	Name		
14	Road			
15	Distance from Nearest Water Source	Type/Distance		
16	Whether Crusher Plant located on Site	Yes/No		
17	Details of the safety precautions during blasting.			
18	Whether local people are aware of the proposed quarry ?	Yes/No		
19	Quantity of top soil removed			
20	Details of the storage of top soil			
21	Plan for the reuse of top soil			
22	Details of the arrangement for proper drainage			

Certified that the furnished information is correct and all relevant information as required is attached.

Contractor

PWD Engineer

App 1100.5.Guidance on Landscaping & Tree Species

7.8 General

Purpose: The purpose of this policy is to provide a list of species that can be used in landscaping for road purposes. Planting is an important part of the road network and can be used as a tool to improve roadside appearance and also to moderate driver behaviour.

Planting is an important part of the road network. It offers an opportunity to:

- Enhance the visual appearance of an area
- Provide shade and shelter for pedestrians
- Improve local air quality and micro-climate
- Reduce soil erosion
- Increase flora and fauna habitat
- Modify vehicle speeds and driver and pedestrian behaviour

The PWD prefers species that have some or all of the following attributes:

- Are indigenous to the area and can be sourced and grown locally
- Provide weather protection
- Require low maintenance and low water consuming
- Are low hazard to people and property
- Enhance the quality of the environment or streetscape
- Will not interfere with utility services

The type of species selected will also depend upon the location of the site, the purpose of the planting and how the space will be used. For example:

- Pedestrian Streetscape Planting
- Median Planting
- Visual Amenity/Thematic
- Waterway Planting
- Noise Barrier and Access Restriction Planting (State and National Highways)
- Planting in Rural Areas

7.9 The Process

A **Landscape Plan** should be prepared for projects either as a separate document or as part of an ESAMP. A **Concept Plan** may be prepared initially, based on a preliminary analysis of the site conditions and the future use of the site. A more detailed Landscape Plan is required when the concept is finalised and should include relevant supporting information. The Landscape Plan should include a Title block with details including date, scale and revision number, dimensioned plan of the site, the proposed location and type of species and the relationship of the site to adjoining areas and the species within those areas. Supporting documentation is to include a site analysis, species selection analysis, detailed species list, proposed maintenance management plan and any other information necessary to justify that the use of landscaping, tree planting and rehabilitation options have been selected to best meet the needs of the specific project. *(Suggest that PWD draft A Guideline on how to prepare a Landscape Plan for inclusion in the Code and Manual. Until then, it is recommended to retain this clause).*

Removal of any vegetation should comply with relevant statutory requirements including the Kerala Preservation of Trees Act (1986) which lists species that are not to be removed without first securing permission.

7.10 Tree plantation guidelines

The following guidelines need to be adhered:

On State Highways, planting should be avoided within 3 metres of the edge of the carriageway.

Beyond 3 metres, planting may be provided where the girth of the trunk of the tree/shrub is less than 300mm at maturity and where it satisfies other relevant specified criteria. In areas of high risk, such as the outer edges of high speed curves, all planting should be avoided within 10 metres of the edge of the carriageways. *Reason: Life Safety*

Species are to be planted and maintained in accordance with nursery recommendations. *Reason: Plant survival*

Large trees should not be planted in locations, such as road corners, where a loss of vehicle control could result in a severe accident. *Reason: Life Safety*

High canopy or low shrubs species should be planted to provide visibility in areas where sight distance may be obscured or to achieve personal safety and security. *Reason: Maintain Sight Distance – safety, personal safety.*

Select species that integrate and complement existing indigenous species and could improve vegetation corridors. *Reason: Visual integration and Enhance Habitat Corridor*

Where theme planting is required, select a few dominant species and replicate their use through the streetscape to create a visual rhythm. *Reason: Visual enhancement*

In urban areas, due to narrow carriageway widths, roadside planting may not be appropriate.

Planting for Medians, traffic islands, traffic management measures, roundabout planting with fencing can be promoted where it does not obscure sight distance or create a traffic hazard. *Reason: Pedestrian safety and Capacity*

For median planting, shrubs should generally not exceed 60 cm in height and should be spaced in accordance with plant specifications. *Reason: Visibility*

Plant species should be selected that avoid impacts on utility services and the roadway. For example potential root damage to underground pipes and pavements and interference with above ground services such as powerlines due to height. *Reason: Avoiding Disruption to Services*

The potential impact on human health and well being such as respiratory ailments caused by flowering species, is to be considered in species selection. *Reason: Human Health*

The propagation and use of native seeds collected from the local site or district is to be promoted. *Reason: Species Health*

The type, location and spacing of species is appropriate for the road speed environment. For example shrubs and small trees could be used in a village area as a tool to reduce driver speeds, manage parking allocation and alter pedestrian behaviour. *Reason: Modify road user behaviour*

For large tracts of land consultation is recommended with the Forestry Department regarding the opportunities associated with mass planting. *Reason: Compensatory habitat and Carbon Sequestration.*

The planting of productive food producing plants, such as coconut palms or herbs is promoted in appropriate locations such as certain oxbow lands only if effective management measures can be implemented. *Reason: Food Supply*

Adequate watering shall be made available during the contract and maintenance period

Specific Landscaping contracts for routine maintenance and watering of medians/islands/oxbow lands may be implemented

7.11 Species List

Table A includes a List of Species Indigenous to Kerala. Examples of species that can be considered are listed below by their Scientific Name, Common Name and Malayalam name. Other species may also be suitable and the reasons for their use justified in the supporting information accompanying the Landscape Plan.

7.12 Other Considerations

Aspects to consider in the selection of species also includes:

- whether fruit or limbs will impact on pedestrians or vehicles
- size at maturity and ultimate girth size
- life span of the species and replacement
- attraction of fauna
- shade and shelter potential
- visual interest
- potential interference with drainage or services or other structures
- irrigation requirements
- personal safety and security
- impact on human health e.g. respiratory
- potential carbon sequestration
- dust and pollution tolerance

Longer Term Suggestions:

Develop Policy Guidelines for Landscape Planning if they do not already exist with reference to more detailed landscape and planting elements including:

- Standard work items
- Payment for landscaping
- Landscape establishment timeframe
- Material type and requirements
- Plant Supply – suppliers, plant specifications, ordering
- Mulching e.g. organic mulch
- Weed Control
- Erosion Control e.g. matting
- Garden Edge Materials e.g. concrete, paving materials
- Irrigation
- Seeding e.g. seed type, watering
- Planting Layout e.g. stakes
- Surface preparation e.g. tilling, cultivation
- Maintenance requirements and program e.g. pruning, pest management, drainage

7.13 Table A: Species List

Sl.No.	Botanical Name	Malayalam Name	Trade/Popular Name	Habit/Nature	Sutability	Character
1	Acalipha brachystachya		Acalipha	Evergreen	Bet.1200-1800 above Sea level	Ornamental Shrub (2-5m tall)
2	Acalipha ciliata		"	Temperate		Ornamental Shrub (2-5m tall)
3	Acalipha dalzillii		"	Tropical		Ornamental Shrub (2-5m tall)
4	Acalipha hispida		"	Sub-tropical		Ornamental Shrub (2-5m tall)
5	Araucaria cookie		Araucaria	Evergreen	Sea coast to mid-hills	Ornamental,Shade, Landscape
6	Azadirachta Indica	Aryaveppu	Neem	Evergreen	All over Kerala	Multi purpose (Tree)
7	Alstonia Scholaris	Ezhilampala	Shaitan wood/Devils Tree	Tropical		Shade, Ornamental Tree
8	Anthocephalus Chinensis	Kadambu	Kadamba	Evergreen	Coastal areas	Shade, Ornamental Tree
9	Agathis robusta		Kauri	Coniferous		Ornamental,Landscape
10	Buettneria herbacea	Rudraksham	Cedar		Plains and Valleys	Shrub, Ornamental, Landscape
11	Butea monosperma	Plasu, Chamatha	Flame of the Forest	Deciduous	Wastelands, Waterlogged areas	Landscape Tree
12	Bauhinia Purpurea		Bauhinia	Evergreen	Plains and Valleys	Avenue,Ornamental,Road sideTree
13	Bauhinia variegata		Kachnar/Mt. ebony	Deciduous	Subtropical up to 800m above sea	Avenue,Ornamental,Road sideTree
14	Barleria cristata		Barleria	Evergreen	Tropical,Subtropical,hills	Hedge,Dwarf tree
15	Chloroxylon swietenia	Varimaram	Satin wood			Shade, Ornamental Tree
16	Chassalia cirviflora	Vellakurunji				Ornamental Shrub
17	Cinnamomum sulphuratum	Vazhana				Landscape Tree
18	Caesalpinia pulcherrinia	Rajamalli	Pride of Barbados			Avenue,Ornamental,Road sideTree
19	Calophyllum inophyllum	Punna	Alexandrian Laurel			Shade, Ornamental Tree
20	Cllistemon lanceolatus		Bottle brush	Evergreen	Plains and Valleys	Avenue,Ornamental,Road sideTree
21	Cassia Fistula	Kanikonna	Amaltas	Deciduous	Plains and Valleys	Avenue,Ornamental,Road sideTree
22	Cestrum nocturnum		Night Jasmine	Evergreen	Valleys,Low hills	Shrub,Ornamental, Landscape
23	Cupressus spp.		Cupressus	Evergreen	Low hills(bushes or small trees)	Landscape, border, Wind break
24	Delonix regia	Gulmohar	Gulmohar	Evergreen	All over Kerala	Landscape Tree
25	Duranta plumieri		Duranta	Evergreen	Warm regions	Ornamental long lasting bush
26	Eugenia Cuspidata Berg		Jamao	Evergreen	Moist areas	Avenue,Ornamental,Road sideTree
27	Erythroxylon monogynum	Velladevadarum	BastaRoad Sandal			Ornamental,Avenue tree
28	Elaeocarpus tuberculatus	Amukkaram	Rudrak			Avenue,Ornamental,Road sideTree
29	Euphorbia royacana		Thor	Evergreen		Waste Ind dev.,Shrub
30	Ervatamia gamblei				All over Kerala	Good foliage & Landscape Tree
31	Ficus robusta		Rubber plant tree	Evergreen	Moist subtropical to tropical	Ornamental, Landscaping tree
32	Grevillea robusta		Silver oak	Deciduous	Subtrop 0 to 2300 m abv sea	Avenue,Ornamental,Road sideTree

33	<i>Garcinia morella</i>	Pachilamaram	Indian Gamboge			Avenue,Ornamental,Road sideTree
34	<i>Helicteris isora</i>	Valmpiri	East Ind Screw Tree			Shrub,Ornamental, Landscape
35	<i>Humboldtia vahliana</i>	Attuvanchi			Riverside etc	Ornamental, Landscaping tree
36	<i>Humboldtia decurrens</i>					Shade, Ornamental Tree
37	<i>Hamelia patens</i>					Avenue,Ornamental,Road sideTree
38	<i>Homskiodia sanguinea</i>					Avenue,Ornamental,Road sideTree
39	<i>Carallia bracteata</i>					Avenue,Ornamental,Road sideTree
40	<i>Jacaranda mimosaefolia</i>		Jacaranda	Evergreen	Valleys,Low hills	Avenue,Ornamental,Road sideTree
41	<i>Largestroemia reginae</i>	Manimaruthu	Queen's Flower		All over Kerala	Landscape, Road side tree
42	<i>Largestroemia microcarpa</i>	Venteak	Naked maiden of forest		All over Kerala	Road side tree
43	<i>Melia azedarach</i>	Malaveppu	Malabar neem		Central and Northern Kerala	Road side tree
44	<i>Murraya Paniculata</i>					Hedge,topiary, road edges. Tree
45	<i>Michelia champaca</i>	Champakam			All over Kerala	Avenue,Ornamental,Road sideTree
46	<i>Mimusops elenji</i>	Elenji			All over Kerala	Avenue,Ornamental,Road sideTree
47	<i>Millingtonia hortensis</i>		Indian Cork tree		All over Kerala	Road side (arbori culture) tree
48	<i>Murraya exotica</i>		Kamini	Evergreen	Warm Subtropical areas	Ornamental small tree
49	<i>Nerium Oleander</i>	Arali				Roadside,Avenue planting Shrub
50	<i>Ochroma Pyramidale</i>	Balsa	Balsa		All over Kerala	Road side planting
51	<i>Olea europea</i>	Olive	Olive	Evergreen	Cold valleys	Avenue,wind break,Road sideTree
52	<i>Optunia spp.</i>		Nagphani	Evergreen	Tropical,Dry areas	Waste Ind dev,Shrub
53	<i>Plumeria rubra</i>	Arali	Pagoda tree			Avenue, tree/shrub
54	<i>Populus ciliata wall.</i>		Poplar	Deciduous	All over Kerala	Road side, soil conservation etc
55	<i>Pongamia pinnata</i>	Punku/Vangu		Evergreen	All over Kerala	Ornamental tree
56	<i>Peltroforum pterocarpum</i>	Chakkarakonna	Yellow flame	Evergreen	All over Kerala	Roadside shade tree
57	<i>Pisonia alba</i>	Marakker	Lettuce tree		Coastal areas	Ornamental shrub
58	<i>Pandanus odoratissimus</i>	Thazhampoo			All over Kerala	Landscape (20 feet)
59	<i>Robinia psuedoacacia</i>		Black Locust	Deciduous	All over Kerala	Avenue, Wood is decay resistant
60	<i>Rawolfia macropylla</i>			Evergreen	All over Kerala	Road side, good foliage
61	<i>Saraca indica Linn.</i>	Asokam	Asok	Evergreen	Mild climatic conditions	Ornamental and avenue
62	<i>Sesbenia grandiflora Poir</i>	Agasty	Agastya/Sesban	Deciduous	Coastal, Subtropical	Ornamental, Landscape tree
63	<i>Spathodia campanulata</i>		Tulip Tree	Evergreen	All over Kerala	Shade, Avenue, Landscape tree
64	<i>Swietenia Mahogani</i>	Cheria mahogany	Mahogany		All over Kerala	Shade Tree
65	<i>Swietenia macrophylla</i>	Mahogany	Mahogany		All over Kerala	Shade Tree
66	<i>Syzygium jambos</i>	Panineerchamba		Evergreen	All over Kerala	Avenue, Road side planting
67	<i>Syzygium wightianum</i>	Thoosivazhana		Evergreen	Valleys,Low hills	Roadside planting
68	<i>Stereospermum suaveolens</i>	Pathiri	Padri	Evergreen	All over Kerala	Avenue, Ornamental
69	<i>Salix tetrasperma</i>	Vanchi	Indain Willow	Deciduous	Tropical, Valley areas	Riverside, Wind break,

70	<i>Thespesia populnia</i> .Soland	Poovarasu	Bhendi/Portia tree	Deciduous	Coastal/All over Keral	Road side planting
71	<i>Terminalia Catappa</i>	Badam	Badam		All over Kerala	Road side, Shade tree
72	<i>Terminalia Crenulata</i>	Thempavu	Kindal		All over Kerala	Road side, Shade tree
73	<i>Tectona grandis</i>	Teak	Teak		All over Kerala	Road side, Avenue
74	<i>Tabernae montana Coronaria</i>				All over Kerala	Road edges
75	<i>Tecoma gaudi chaudi</i>		Tecoma	Evergreen	All over Kerala	Road edges (Shrub)
76	<i>Tamarix articulata Vahl</i>		Pala	Deciduous	Dry areas	Wind break, Shelter, Road side
77	<i>Terminalia Arjuna</i> Bedd.		Arjuna	Evergreen	Near water coarses	Shade Tree, Landscape
78	<i>Thuja occidentalis</i>	Thuja	Thuja	Evergreen	Subtropical, Tropical	Foliage, wind break, Shade
79	<i>Wrightia tinctoria</i>	Danthappala	Ivory wood		Valleys,Low hills	Shade tree
80	<i>Zamia pumila</i> -Zamiaceae					Good for road islands(Shrub)

App 1100.6. Guidance on Public Consultations

General principles

1	Consultation should be undertaken as early as possible	<p>Consultation should be undertaken as early as possible before the project starts. The need for information prior to any formal consultation should be considered. Each circle should prepare a profile of the community which shows the demographic profile, groups, cultures, issues etc. Particularly for face to face consultation such as workshops, the following is recommended:</p> <ul style="list-style-type: none">• Establish protocols for conducting the consultation (e.g. respect the views of all people even if you don't agree, only one person to talk at a time, max)• Explain the project/issue• Outline of the role of the stakeholders in the overall decision-making process• Identify the key stakeholder issues• Outline the proposed consultation process• Approve the consultation schedule
2	The decision-making process should be transparent	<p>Consider using an independent person to conduct the consultation</p> <p>Outline the roles of the decision-makers and the status of stakeholder inputs</p> <p>Clarify the scope of the consultation discussion e.g. issues related only to that project</p> <p>Document input received and allow participants to access the inputs if required</p> <p>Record and document all actions</p> <p>Consider developing criteria with stakeholders to weigh up or rank the most important issues</p> <p>Feedback to the stakeholders on the outcomes of the consultation process and how their input has been incorporated or why their input was not incorporated</p> <p>Use recognized or auditable processes for information distribution such as press release, media conference,</p> <p>Consider establishing a reference group (which includes external stakeholders) to oversee implementation of the consultation plan</p>
3	Allow sufficient time for stakeholders to participate process	<p>Adequate time should be provided to allow stakeholders to participate in the consultation process e.g. 10 days notice. Adjust the Consultation activities (type, timeframe and location of consultation) to suit the local needs. Consider the following:</p> <ul style="list-style-type: none">• how accessible it is for stakeholders to participate e.g. district or panchayat• will the time of day and day of the week affect

	<p>participation e.g. Sunday</p> <ul style="list-style-type: none"> any cultural activities, holiday periods or public events Advise stakeholders of any changes to the proposed schedule.
4	<p>The process should facilitate participation by all relevant stakeholders</p> <p>Identify all relevant stakeholders who are genuinely interested in or affected by the proposed project. This could include: Affected property owners; occupants; business, institutions; government and non-government agencies; Elected Representatives; Transport user groups; Media; Special interest groups (environment, educational, industry or representatives of cultural properties). Consider the input of people with special needs or interests such as children, visually impaired or physically less mobile, low literacy or women. Find ways of including them in the consultation process</p>
5	<p>Sufficient information should be made available about the project, issue or activity to inform input by stakeholders</p> <p>Access to background information increases understanding and can better inform stakeholder input. In preparing the Communications Plan, consider how participants will be able to get access information easily. Use diagrams, maps, drawings and easy to understand concepts if possible when preparing materials. Examples include:</p> <ul style="list-style-type: none"> Internet e.g. PWD Web Portal Newspaper advertisements Flyers in shops and offices Telephone recorded message Newsletter or letter NGO's or other representative groups
6	<p>Comments should be recorded in a database and considered in the decision-making process</p> <p>Develop a stakeholder register listing the participants name and contact details (as agreed) and issues of concern or suggestions. The register can be used as a base document for the decision-maker to complete and respond to the issues identified, record all views, acknowledge different view points, try to create an environment that makes people feel comfortable get professional advice if necessary e.g. dispute resolution</p>
7	<p>Respond to all comments and document</p> <p>Respond to each comment and state if and how it is to be addressed by the decision maker. This information should be made available for participants to provide for transparency in decision-making.</p>
8	<p>Feedback to stakeholders on the final decision</p> <p>Feedback helps participants gain a better understanding. They also feel they have been listened to and their concerns considered. It is not always possible to address all concerns, so the extent</p>

to which comments or concerns have been addressed should also be fed back to the stakeholders. This process builds trust in the community and is important for maintaining the profile of PWD. Similar methods can be used to feedback to the community as it was to get their input.

Appendix 1100.7. Guidance for preparing management measures where project-specific EMP are required

S. No.	Environmental Issue	Management Measures
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PS.P. PRE-CONSTRUCTION STAGE		
PS.P.1	Land Acquisition	<p>The acquisition of land and private properties will be carried out in accordance with the Resettlement Action Plan (RAP) and entitlement framework for the project.</p> <p>PWD has to ascertain that any additional environmental impacts resulting from acquisition of land shall be addressed and integrated into the EMP and other relevant documents.</p>
PS.P.2	EMP preparation for Resettlement Sites	<p>All Resettlement & Rehabilitation (R&R) activities will be undertaken in accordance with the RAP document. It will be ensured that all R&R activities including environmental management plan preparation are completed before the construction activity starts, on any section of ROW of existing road and/or proposed new bypasses.</p> <p>EMPs for the Resettlement Site will be prepared in consultation with the concerned community. Plans will include specific actions in relation to health, hygiene and plantation</p>
PS.P.3	Preservation of Trees	<p>All efforts will be made to preserve trees including evaluation of minor design adjustments/alternatives (as applicable) to save trees. Specific attention will be given for protecting giant trees, green tunnels and locally important trees (religiously important etc.).</p> <p>Tree cutting is to proceed only after all the legal requirements including attaining of In-principle and Formal Clearances from the Forest Dept./DoEF/MoEF are completed and subsequently a written order is issued to the Contractor.</p> <p>Particular species declared as 'protected' by the State's Forest Dept. in the private land will be felled only after due clearance from the Forest Dept. is obtained.</p> <p>In the event of design changes, additional assessments including the possibility to save trees shall be made. Stacking, transport and storage of the wood will be done as per the relevant norms.</p> <p>Systematic corridor level documentation for the trees cut and those saved will be maintained by the PWD.</p>
PS.P.4	Relocation of Community Utilities and Common Property Resources	<p>All community utilities and properties i.e., water supply lines, sewer lines, bank buildings, health centers, schools, health clinics and veterinary hospitals will be relocated before construction starts, on any section of the project corridor. The PWD will relocate these properties in consultation and written agreement with the agency/ owner/community. The schools and health centers will be constructed as per the relevant state norms.</p>

S. No.	Environmental Issue	Management Measures
		<p>All other community property resources within the corridor of impact such as hand pumps, ponds, grazing lands etc. will be relocated.</p> <p>The relocation sites for these schools will be identified in accordance with the choice of the community. Environmental considerations with suitable/required actions including health and hygiene aspects will be kept in mind while relocating all community utilities and resources.</p>
PS.P.5	Relocation of affected Cultural and Religious Properties	<p>All religious property resources such as shrines, temples and mosques within the project zone will be relocated.</p> <p>Sites for the relocation of these religious structures will be identified in accordance with the choice of the community. The NGO and PWD in consultation with local people will finalize design of these temples. As far as possible, the architectural elements of the structure should be conserved/reflected/translated into the design of new structures.</p> <p>The entire process (i.e. selection of relocation sites and designs) will be under supervision of Environmental Expert of Supervision Consultants / Environment Cell of PWD. The relocation will be completed before the construction starts in these sites.</p>
PS.P.6.	Joint Field Verification to assess the need to modify the contract documents	<p>The Environmental Expert of SC / Environment Cell of PWD and the Contractor will carry out joint field verification to ascertain the possibility to saving trees, environmental and community resources.</p> <p>The verification exercise should assess the need for additional protection measures or changes in design/scale/nature of protection measures including the efficacy of enhancement measures suggested in the EMP. Proper documentation and justifications/reasons shall be maintained in all such cases where deviation from the original EMP is proposed.</p>
PS.P.7	Assessment of Impacts due to Changes/Revisions/Additions due to PS.P.6 in the Project Work	<p>The Environmental Expert of SC / Environment Cell of PWD will assess impacts and revise/modify the EMP and other required sections of the project document/s in the event of changes/revisions (including addition or deletion) in the project's scope of work.</p>
PS.P.8	Crushers, hot-mix plants and Batching Plants Location	<p>Hot mix plants and batching plants will be sited sufficiently away from settlements and agricultural operations or any commercial establishments. Such plants will be located at least 150 m away from the nearest village/settlement preferably in the downwind direction.</p> <p>The Contractor shall submit a detailed lay-out plan for all such sites and approval of Environmental Expert</p>

S. No.	Environmental Issue	Management Measures
		<p>of SC / Environment Cell of PWD shall be necessary prior to their establishment.</p> <p>Arrangements to control dust pollution through provision of wind screens, sprinklers, dust encapsulation will have to be provided at all such sites.</p> <p>Specifications of crushers, hot mix plants and batching plants will comply with the requirements of the relevant current emission control legislations and Consent/NOC for all such plants shall be submitted to the SC and PWD.</p> <p>The Contractor shall not initiate plant/s operation till the required legal clearances are obtained and submitted.</p>
PS.P.9	Other Construction Vehicles, Equipment and Machinery	<p>All vehicles, equipment and machinery to be procured for construction will conform to the relevant Bureau of India Standard (BIS) norms. The discharge standards promulgated under the Environment Protection Act, 1986 will be strictly adhered to.</p> <p>Noise limits for construction equipments to be procured such as compactors, rollers, front loaders concrete mixers, cranes (moveable), vibrators and saws will not exceed 75 dB (A), measured at one meter from the edge of the equipment in free field, as specified in the Environment (Protection) Rules, 1986.</p> <p>The Contractor shall maintain a record of PUC for all vehicles and machinery used during the contract period.</p>
PS.P.10	Borrow Areas	<p>Finalizing borrow areas for borrowing earth and all logistic arrangements as well as compliance to environmental requirements, as applicable, will be the sole responsibility of the contractor.</p> <p>The Contractor will not start borrowing earth from select borrow area until the formal agreement is signed between land owner and contractor and a copy is submitted to the SC and the PWD.</p> <p>Locations finalized by the contractor shall be reported to the Environmental Expert of SC / Environment Cell of PWD and who will in turn report to PWD. Format for reporting will be as per the Reporting Format for Borrow Area and will include a reference map.</p> <p>Planning of haul roads for accessing borrow materials will be undertaken during this stage. The haul roads shall be routed to avoid agricultural areas as far as possible (in case such a land is disturbed, the Contractor will rehabilitate it as per Borrow Area Rehabilitation Guidelines) and will use the existing village roads wherever available.</p> <p>In addition to testing for the quality of borrow materials by the SC, the environmental personnel of the SC will be required to inspect every borrow area location prior to approval (follow criteria for evaluation of borrow areas).</p>

S. No.	Environmental Issue	Management Measures
PS.P.11	Fly Ash	<p>Contractor will work out proper haulage network for transportation of fly ash from plant to project site. If any village road is identified for transportation of fly ash, the road will be improved before starting the transport work.</p> <p>The haul road will avoid using agricultural land (in case such a land is disturbed, the Contractor will rehabilitate it as per Borrow Area Rehabilitation Guidelines) and try to use the existing road network of the area wherever possible.</p> <p>The contractor will consult the Environmental Expert of SC / Environment Cell of PWD before finalizing the haulage network and also take necessary approval from the expert. SC in turn report to the PWD before giving final approval to the contractor.</p>
PS.P.12	Quarry	<p>Contractor will finalize the quarry for procurement of construction materials after assessment of the availability of sufficient materials and other logistic arrangements.</p> <p>In case the contractor decides to use quarries other than recommended by DPR consultants, then it will be selected based on the suitability of the materials.</p> <p>The contractor will procure necessary permission for procurement of materials from Mining Department, District Administration and State Pollution Control Board and shall submit a copy of the approval and the rehabilitation plan to the PWD and Environmental Expert of the SC.</p> <p>Contractor will also work out haul road network and report to Environmental Expert of SC / Environment Cell of PWD and SC will inspect and in turn report to PWD before approval.</p>
PS.P.13	Arrangement for Construction Water	<p>The contractor will use ground water as a source of water for the construction and will set up the own bore well facility for construction work.</p> <p>Contractor can use the ponds, which are not in use by community or identified to fill up for the project, but in that case, before using any pond water contractor will obtain written consent from the owner and submit then to SC.</p> <p>To avoid disruption/disturbance to other water users, the contractor will extract water from fixed locations and consult the Environmental Expert of SC / Environment Cell of PWD before finalizing the locations.</p> <p>The Contractor will provide a list of locations and type of sources from where water for construction will be used.</p> <p>The contractor will not be allowed to pump from any irrigation canal and surface water bodies used by community.</p> <p>The contractor will need to comply with the requirements of the State Ground Water Department and seek</p>

S. No.	Environmental Issue	Management Measures
		their approval for doing so and submit copies of the permission to SC and PWD.
PS.P.14	Labor Requirements	The contractor preferably will use unskilled labor drawn from local communities to give the maximum benefit to the local community.
PS.P.15	Construction Camp Locations – Selection, Design and Lay-out	<p>Siting of the construction camps will be as per the guidelines below. Locations identified by the contractor will report as per format given.</p> <p>Construction camps will not be proposed within 500 m from the nearest settlements to avoid conflicts and stress over the infrastructure facilities with the local community.</p> <p>Location for stockyards for construction materials will be identified at least 200 m from water courses.</p> <p>The waste disposal and sewage system for the camp will be designed, built and operated such that no odor is generated.</p> <p>Unless otherwise arranged by the local sanitary authority, arrangements for disposal of night soils (human excreta) suitably approved by the local medical health or municipal authorities or as directed by Environmental Expert of SC / Environment Cell of PWD will have to be provided by the contractor.</p>
PS.P.16	Arrangements for Temporary Land Requirement	<p>The contractor as per prevalent rules will carry out negotiations with the landowners for obtaining their consent for temporary use of lands for construction sites/hot mix plants/traffic detours/borrow areas etc.</p> <p>The Environmental Expert of SC / Environment Cell of PWD will be required to ensure that the clearing up of site prior to handing over to the owner (after construction or its completion) is included in the contract.</p>
PS.P.17	Orientation of Implementing Agency and Contractors	<p>The PWD shall organize orientation sessions and regular training sessions during all stages of the project.</p> <p>This shall include on-site training (general as well as in the specific context of a sub-project). These sessions shall involve all staff of Environmental Cells, field level implementation staff of PWD, Environmental Experts of SCs and Contractors.</p>

S. No.	Environmental Aspect/Issue	Management Measures
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PS.C. CONSTRUCTION STAGE		
PS.C.1	Clearing and Grubbing	<p>Vegetation will be removed from the construction zone before commencement of construction. All works will be carried out such that the damage or disruption to flora other than those identified for cutting is minimal.</p> <p>Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works will be removed with prior approval from the Environmental Expert of SC / Environment Cell of PWD.</p> <p>The contractor, under any circumstances will not cut or damage trees. Trees identified under the project will be cut only after receiving clearance from the Forest Dept./DoEF/MoEF (as applicable) and after the receipt of PWD's written permission in this regard.</p> <p>Vegetation only with girth of over 30 cm will be considered as trees and shall be compensated, in the event of PWD's instruction to undertake tree cutting.</p>
PS.C.2	Generation of Debris from dismantling structures and road surface	<p>Debris generated due to the dismantling of the existing road will be suitably reused in the proposed construction, subject to the suitability of the materials and approval of the SC and Environmental Expert of SC / Environment Cell of PWD as follows:</p> <p>The sub grade of the existing pavement shall be used as embankment fill material.</p> <p>The existing base and sub-base material shall be recycled as sub-base of the haul road or access roads</p> <p>The existing bitumen surface may be utilized for the paving of cross roads, access roads and paving works in construction sites and campus, temporary traffic diversions, haulage routes etc.</p> <p>The contractor will suitably dispose off unutilized debris materials either through filling up of borrow areas located in wasteland or at pre-designated disposal locations, subject to the approval of the Environmental Expert of SC / Environment Cell of PWD.</p> <p>At locations identified for disposal of residual bituminous wastes, the disposal will be carried out over a 60 mm thick layer of rammed clay so as to eliminate the possibility of leaching of wastes into the ground water. The contractor will ensure that the surface area of such disposal pits is covered with a layer of soil.</p> <p>All arrangements for transportation during construction including provision, maintenance, dismantling and clearing debris, will be considered incidental to the work and will be planned and implemented by the contractor as approved and directed by the Environmental Expert of SC / Environment Cell of PWD.</p> <p>The pre-designed disposal locations will be a part of Comprehensive Solid Waste Management Plan to be prepared by Contractor in consultation and with approval of Environmental Expert of SC / Environment</p>

S. No.	Environmental Aspect/Issue	Management Measures
		<p>Cell of PWD. Debris generated from pile driving or other construction activities shall be disposed such that it does not flow into the surface water bodies or form mud puddles in the area. The contractor shall identify dumping sites. The identified locations will be reported to the Environmental Expert of SC / Environment Cell of PWD. These locations will be checked on site and accordingly approved by Environmental Expert of SC / Environment Cell of PWD prior to any disposal of waste materials.</p>
PS.C.3	Other Construction Wastes Disposal including Fly Ash	<p>The pre-identified disposal locations will be a part of Comprehensive Waste Disposal Solid Waste Management Plan to be prepared by the Contractor in consultation and with approval of Environmental Expert of SC / Environment Cell of PWD. Location of disposal sites will be finalized prior to completion of the earthworks on any particular section of the road. The Environmental Expert of SC / Environment Cell of PWD will approve these disposal sites after conducting a joint inspection on the site with the Contractor. Contractor will ensure that any spoils of material unsuitable for embankment fill will not be disposed off near any water course, agricultural land, and natural habitat like grass lands or pastures. Such spoils from excavation can be used to reclaim borrow pits and low-lying areas located in barren lands along the project corridors (is so desired by the owner/community). No fly ash will be disposed in any disposal site. Contractor will take care of residual fly ash, if any that remains after construction work. Either this will be returned to the source or used in construction of embankment elsewhere with proper protection measures. SC will keep strict vigil on this aspect. Non-bituminous wastes other than fly ash may be dumped in borrow pits (preferably located in barren lands) covered with a layer of the soil. No new disposal site shall be created as part of the project, except with prior approval of the Environmental Expert of SC / Environment Cell of PWD. All waste materials will be completely disposed and the site will be fully cleaned and certified by Environmental Expert of SC / Environment Cell of PWD before handing over.</p> <p>The contractor at its cost shall resolve any claim, arising out of waste disposal or any non-compliance that</p>

S. No.	Environmental Aspect/Issue	Management Measures
		may arise on account of lack of action on his part.
PS.C.4	Stripping, stocking and preservation of top soil	<p>The top soil from all areas of cutting and all areas to be permanently covered will be stripped to a specified depth of 150 mm and stored in stockpiles. A portion of the temporarily acquired area and/or Right of Way will be earmarked for storing topsoil. The locations for stock piling will be pre-identified in consultation and with approval of Environmental Expert of SC / Environment Cell of PWD. The following precautionary measures will be taken to preserve them till they are used:</p> <p>(a) Stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and height of the pile is restricted to 2 m. To retain soil and to allow percolation of water, the edges of the pile will be protected by silt fencing.</p> <p>(b) Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur. The stockpiles shall be covered with gunny bags or vegetation.</p> <p>(c) It will be ensured by the contractor that the top soil will not be unnecessarily trafficked either before stripping or when in stockpiles.</p> <p>Such stockpiled topsoil will be utilized for - covering all disturbed areas including borrow areas (not those in barren areas) top dressing of the road embankment and fill slopes filling up of tree pits, in the median and in the agricultural fields of farmers, acquired temporarily. Residual topsoil, if there is any will be utilized for the plantation at median and side of the main carriageway.</p>
PS.C.5	Accessibility	<p>The contractor will provide safe and convenient passage for vehicles, pedestrians and livestock to and from roadsides and property accesses connecting the project road, providing temporary connecting road.</p> <p>The contractor will also ensure that the existing accesses will not be undertaken without providing adequate provisions and to the prior satisfaction of Environmental Expert of SC / Environment Cell of PWD.</p> <p>The contractor will take care that the cross roads are constructed in such a sequence that construction work over the adjacent cross roads are taken up one after one so that traffic movement in any given area not get</p>

S. No.	Environmental Aspect/Issue	Management Measures
		affected much.
PS.C.6	Planning for Traffic Diversions and Detours	<p>Temporary diversions will be constructed with the approval of the SC and Environmental Expert of SC / Environment Cell of PWD.</p> <p>Detailed Traffic Control Plans will be prepared and submitted to the Environmental Expert of SC / Environment Cell of PWD for approval, five days prior to commencement of works on any section of road. The traffic control plans shall contain details of temporary diversions, traffic safety arrangements for construction under traffic, details of traffic arrangement after cessation of work each day, safety measures undertaken for transport of hazardous materials and arrangement of flagmen.</p> <p>The Contractor will provide specific measures for safety of pedestrians and workers at night as a part of traffic control plans. The Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow.</p> <p>The contractor will also inform local community of changes to traffic routes, conditions and pedestrian access arrangements with assistance from SC and PWD. The temporary traffic detours will be kept free of dust by sprinkling of water three times a day and as required under specific conditions (depending on weather conditions, construction in the settlement areas and volume of traffic).</p>
PS.C.7	Earth from Borrow Areas for Construction	<p>No borrow area will be opened without permission of the Environmental Expert of SC / Environment Cell of PWD. The location, shape and size of the designated borrow areas will be as approved by the Environmental Expert of SC / Environment Cell of PWD and in accordance to the IRC recommended practice for borrow pits for road embankments (IRC 10: 1961). The borrowing operations will be carried out as specified in the guidelines for sitting and operation of borrow areas.</p> <p>The unpaved surfaces used for the haulage of borrow materials, if passing through the settlement areas or habitations; will be maintained dust free by the contractor. Sprinkling of water will be carried out twice a day to control dust along such roads during their period of use.</p> <p>During dry seasons (winter and summer) frequency of water sprinkling will be increased in the settlement areas and Environmental Expert of SC / Environment Cell of PWD will decide the numbers of sprinkling depending on the local requirements.</p> <p>Contractor will rehabilitate the borrow areas as soon as borrowing is over from a particular borrow area in accordance with the Guidelines for Redevelopment of Borrow Areas or as suggested by Environmental Expert of SC / Environment Cell of PWD.</p>

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PS.C.8	Fly Ash	<p>Contractor will ensure that they will strictly follow the specification given in IRC: SP: 58 for fly ash embankment construction. Further, Contractor will also ensure that -</p> <p>Fly ash will be transported in covered dump truck to the project site and is directly dumped on the embankment. This will not be stockpiled at project site.</p> <p>Weathered (at least not freshly generated) fly ash will be collected from the fly ash pond to reduce the possibility of water contamination due to leaching of heavy metals.</p> <p>Fly ash surface will be graded and sloped at the end of each working day to provide drainage and to prevent the ponding of water or the formation of run-off channel.</p> <p>The side slope will be properly benched and covered with soil and later vegetation will be grown to prevent the erosion.</p> <p>Run-off from the fly ash embankment/stockpile will be collected and discharged into proper drainage system.</p> <p>Further handling, if any will be restricted within ROW. During such handling and also after placing on embankment, if the fly ash surface is dries up completely, contractor will arrange for frequent sprinkling of water for dust suppression. Otherwise, surface of the fly ash will be covered with tarpaulin or polyethylene sheets or other suitable material.</p> <p>The fly ash will be placed on an aggregate drainage blanket to prevent water from rising into the fly ash by way of capillary action. Contractor will ensure that fly ash layer is separated from the drainage blanket by an appropriate filter fabric/sand blanket of adequate thickness over full width of embankment as capillary cut-off.</p> <p>Environmental Expert of SC / Environment Cell of PWD will be required to inspect and report regularly to ensure the compliance in this regard.</p>
PS.C.9	Quarry Operations	<p>The contractor shall obtain materials for quarries only after consent of the Department of Mining and District Administration.</p> <p>The contractor will develop a Comprehensive Quarry Redevelopment plan, as per the Mining Rules of the state and submit a copy to PWD and SC prior to opening of the quarry site.</p> <p>The quarry operations will be undertaken within the rules and regulations in force.</p>
PS.C.10	Transporting Construction	<p>Contractor will maintain all roads (existing or built for the project), which are used for transporting construction materials, equipment and machineries as précised. All vehicles delivering fine materials to the</p>

S. No.	Environmental Aspect/Issue	Management Measures
	Materials and Haul Road Management	<p>site will be covered to avoid spillage of materials.</p> <p>All existing highways and roads used by vehicles of the contractor or any of his sub-contractor or suppliers of materials and similarly roads, which are part of the works, will be kept clear of all dust/mud or other extraneous materials dropped by such vehicles.</p> <p>Contractor will arrange for regular water sprinkling as necessary for dust suppression of all such roads and surfaces.</p> <p>The unloading of materials at construction sites in/close to settlements will be restricted to daytime only.</p>
PS.C.11	Construction Water	<p>Contractor will arrange adequate supply and storage of water for the whole construction period at his own costs. The Contractor will submit a list of source/s from where water will be used for the project to SC and PWD.</p> <p>The contractor will source the requirement of water preferentially from ground water but with prior permission from the Ground Water Board. A copy of the permission will be submitted to SC and PWD prior to initiation of construction.</p> <p>The contractor will take all precaution to minimize the wastage of water in the construction process/ operation.</p>
PS.C.12	River Training and Disruption to Other Users of Water	<p>While working across or close to any perennial water bodies, contractor will not obstruct/ prevent the flow of water.</p> <p>Construction over and close to the non-perennial streams shall be undertaken in the dry season. If construction work is expected to disrupt users of community water bodies, notice shall be served well in advance to the affected community.</p> <p>The contractor will serve notice to the down stream users well in advance to divert the flow of water of any surface water body. Wherever excavation for diverting water flow will take place, contractor will ensure that the slopes are not steeper than 1:2 (vertical: horizontal) otherwise proper slope protection measures will be taken as approved by the Environmental Expert of SC / Environment Cell of PWD.</p> <p>The contractor will take prior approval of the River Authority or Irrigation Department or SC for any such activity. The PWD will ensure that contractor has served the notice to the downstream users of water well in advance.</p>
PS.C.13	Drainage and Flood Control	<p>Contractor will ensure that no construction materials like earth, stone, ash or appendage disposed off so as not to block the flow of water of any water course and cross drainage channels.</p>

S. No.	Environmental Aspect/Issue	Management Measures
		Contractor will take all necessary measures to prevent the blockage of water flow. In addition to the design requirements, the contractor will take all required measures as directed by the Environmental Expert of SC / Environment Cell of PWD to prevent temporary or permanent flooding of the site or any adjacent area.
PS.C.14	Siltation of Water Bodies and Degradation of Water Quality	<p>The Contractor will not excavate beds of any stream/canals/ any other water body for borrowing earth for embankment construction.</p> <p>Contractor will construct silt fencing at the base of the embankment construction for the entire perimeter of any water body (including wells) adjacent to the RoW and around the stockpiles at the construction sites close to water bodies. The fencing will be provided prior to commencement of earthwork and continue till the stabilization of the embankment slopes, on the particular sub-section of the road.</p> <p>The contractor will also put up sedimentation cum grease traps at the outer mouth of the drains located in truck lay byes and bus bays which are ultimately entering into any surface water bodies / water channels with a fall exceeding 1.5 m.</p> <p>Contractor will ensure that construction materials containing fine particles are stored in an enclosure such that sediment-laden water does not drain into nearby water course.</p>
PS.C.15	Slope Protection and Control of Soil Erosion	<p>The contractor will take slope protection measures as per design, or as directed by the Environmental Expert of SC / Environment Cell of PWD to control soil erosion and sedimentation through use of dykes, sedimentation chambers, basins, fibber mats, mulches, grasses, slope, drains and other devices.</p> <p>All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the earth work or other items of work and as such as no separate payment will be made for them.</p> <p>Contractor will ensure the following aspects:</p> <p>During construction activities on road embankment, the side slopes of all cut and fill areas will be graded and covered with stone pitching, grass and shrub as per design specifications.</p> <p>Turfing works will be taken up as soon as possible provided the season is favorable for the establishment of grass sods. Other measures of slope stabilization will include mulching netting and seeding of batters and drains immediately on completion of earthworks.</p> <p>In borrow pits, the depth shall be so regulated that the sides of the excavation will have a slope not steeper than 1 vertical to 2 horizontal, from the edge of the final section of the bank.</p> <p>Along sections abutting water bodies, stone pitching as per design specification will protect slopes.</p>
PS.C.16	Water Pollution	The Contractor will take all precautionary measures to prevent the wastewater generated during

S. No.	Environmental Aspect/Issue	Management Measures
	from Construction Wastes	<p>construction from entering into streams, water bodies or the irrigation system. Contractor will avoid construction works close to the streams or water bodies during monsoon.</p> <p>All waste arising from the project is to be disposed off in the manner that is acceptable to the State Pollution Control Board or as directed by Environmental Expert of SC / Environment Cell of PWD.</p> <p>The Environmental Expert of SC / Environment Cell of PWD will certify that all liquid wastes disposed off from the sites meet the discharge standards.</p>
PS.C.17	Water Pollution from Fuel and Lubricants	<p>The contractor will ensure that all construction vehicle parking location, fuel/lubricants storage sites, vehicle, machinery and equipment maintenance and refueling sites will be located at least 500 m from rivers and irrigation canal/ponds.</p> <p>All location and lay-out plans of such sites will be submitted by the Contractor prior to their establishment and will be approved by the Environmental Expert of SC / Environment Cell of PWD and PWD.</p> <p>Contractor will ensure that all vehicle/machinery and equipment operation, maintenance and refueling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Oil interceptors will be provided for vehicle parking, wash down and refueling areas as per the design provided. In all, fuel storage and refueling areas, if located on agricultural land or areas supporting vegetation, the top soil will be stripped, stockpiled and returned after cessation of such storage.</p> <p>Contractor will arrange for collection, storing and disposal of oily wastes to the pre-identified disposal sites (list to be submitted to SC and PWD) and approved by the Environmental Expert of SC / Environment Cell of PWD. All spills and collected petroleum products will be disposed off in accordance with MoEF and state PCB guidelines.</p> <p>Environmental Expert of SC / Environment Cell of PWD will certify that all arrangements comply with the guidelines of PCB/ MoEF or any other relevant laws.</p>
PS.C.18	Dust Pollution	<p>The contractor will take every precaution to reduce the level of dust from crushers/hot mix plants, construction sites involving earthwork by sprinkling of water, encapsulation of dust source and by erection of screen/barriers.</p> <p>All the plants will be sited at least 150 m in the downwind direction from the nearest human settlement.</p> <p>The contractor will provide necessary certificates to confirm that all crushers used in construction conform to relevant dust emission control legislation.</p> <p>The suspended particulate matter value at a distance of 40m from a unit located in a cluster should be less</p>

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		<p>than 500 g/m³. The pollution monitoring is to be conducted as per the monitoring plan. Alternatively, only crushers licensed by the PCB shall be used. Required certificates and consents shall be submitted by the Contractor in such a case.</p> <p>Dust screening vegetation will be planted on the edge of the RoW for all existing roadside crushers. Hot mix plant will be fitted with dust extraction units.</p>
PS.C.19	Emission from Construction Vehicles, Equipment and Machineries	<p>Contractor will ensure that all vehicles, equipment and machinery used for construction are regularly maintained and confirm that pollution emission levels comply with the relevant requirements of PCB. The Contractor will submit PUC certificates for all vehicles/ equipment/machinery used for the project. Monitoring results will also be submitted to SC and PWD as per the monitoring plan.</p>
PS.C.20	Noise Pollution: Noise from Vehicles, Plants and Equipments	<p>The Contractor will confirm the following:</p> <p>All plants and equipment used in construction shall strictly conform to the MoEF/CPCB noise standards. All vehicles and equipment used in construction will be fitted with exhaust silencers. Servicing of all construction vehicles and machinery will be done regularly and during routine servicing operations, the effectiveness of exhaust silencers will be checked and if found defective will be replaced. Limits for construction equipment used in the project such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB (A) (measured at one meter from the edge of equipment in the free field), as specified in the Environment (Protection) rules, 1986. Maintenance of vehicles, equipment and machinery shall be regular and up to the satisfaction of the Environmental Expert of SC / Environment Cell of PWD to keep noise levels at the minimum.</p> <p>At the construction sites within 150 m of the nearest habitation, noisy construction work such as crushing, concrete mixing, batching will be stopped during the night time between 9.00 pm to 6.00 am. No noisy construction activities will be permitted around educational institutes/health centers (silence zones) up to a distance of 100 m from the sensitive receptors i.e., school, health centers and hospitals between 9.00 am to 6.0 pm.</p> <p>Contractor will provide noise barriers (Design of Noise Barrier Provided) to the suggested locations of select schools/ health centers. List of locations for noise barriers is given in specific EMP. Monitoring shall be carried out at the construction sites as per the monitoring schedule and results will be</p>

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		submitted to SC and PWD. Environmental Expert of SC / Environment Cell of PWD will be required to inspect regularly to ensure the compliance of EMP.
PS.C.21	Personal Safety Measures for Labour	<p>Contractor will provide:</p> <p>Protective footwear and protective goggles to all workers employed on mixing asphalt materials, cement, and lime mortars, concrete etc.</p> <p>Welder's protective eye-shields to workers who are engaged in welding works</p> <p>Protective goggles and clothing to workers engaged in Factories Act, 1948 stone breaking activities and workers will be seated at sufficiently safe intervals</p> <p>Earplugs to workers exposed to loud noise, and workers working in crushing, compaction, or concrete mixing operation.</p> <p>Adequate safety measures for workers during handling of materials at site are taken up.</p> <p>The contractor will comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress.</p> <p>The contractor will comply with all the precautions as required for ensuring the safety of the workmen as per the International Labor Organization (ILO) Convention No. 62 as far as those are applicable to this contract.</p> <p>The contractor will make sure that during the construction work all relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 are adhered to.</p> <p>The contractor will not employ any person below the age of 14 years for any work and no woman will be employed on the work of painting with products containing lead in any form.</p> <p>The contractor will also ensure that no paint containing lead or lead products is used except in the form of paste or readymade paint.</p> <p>Contractor will provide facemasks for use to the workers when paint is applied in the form of spray or a surface having lead paint dry is rubbed and scrapped.</p> <p>The Contractor will mark 'hard hat' and 'no smoking' and other 'high risk' areas and enforce non-compliance of use of PPE with zero tolerance. These will be reflected in the Construction Safety Plan to be prepared by the Contractor during mobilization and will be approved by SC and PWD.</p>
PS.C.22	Traffic and	The contractor will take all necessary measures for the safety of traffic during construction and provide,

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	Safety	erect and maintain such barricades, including signs, markings, flags, lights and flagmen as proposed in the Traffic Control Plan/Drawings and as required by the Environmental Expert of SC / Environment Cell of PWD for the information and protection of traffic approaching or passing through the section of any existing cross roads. The contractor will ensure that all signs, barricades, pavement markings are provided as per the MoRTH specifications. Before taking up of construction on any section of the existing lanes of the highway, a Traffic Control Plan will be devised and implemented to the satisfaction of the Environmental Expert of SC / Environment Cell of PWD.
PS.C.23	Risk from Electrical Equipment(s)	The Contractor will take all required precautions to prevent danger from electrical equipment and ensure that - No material will be so stacked or placed as to cause danger or inconvenience to any person or the public.. All necessary fencing and lights will be provided to protect the public in construction zones. All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be free from patent defect, will be kept in good working order, will be regularly inspected and properly maintained as per IS provision and to the satisfaction of the Environmental Expert of SC / Environment Cell of PWD.
PS.C.24	Risk Force Measure	The contractor will take all reasonable precautions to prevent danger to the workers and public from fire, flood etc. resulting due to construction activities. The contractor will make required arrangements so that in case of any mishap all necessary steps can be taken for prompt first aid treatment. Construction Safety Plan prepared by the Contractor will identify necessary actions in the event of an emergency.
PS.C.25	First Aid	The contractor will arrange for: <ul style="list-style-type: none"> • A readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone • Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital • Equipment and trained nursing staff at construction camp.
PS.C.26	Informatory Signs and Hoardings	The contractor will provide, erect and maintain informatory/safety signs, hoardings written in English and local language, wherever required or as suggested by the Environmental Expert of SC / Environment Cell of PWD.

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PS.C.27	Road side Plantation Strategy	<p>The contractor will do the plantation at median and/or turfing at embankment slopes as per the tree plantation strategy prepared for the project.</p> <p>Minimum 80 percent survival rate of the saplings will be acceptable otherwise the contractor will replace dead plants at his own cost. The contractor will maintain the plantation till they handover the project site to PWD.</p> <p>The Environmental Expert of SC / Environment Cell of PWD will inspect regularly the survival rate of the plants and compliance of tree plantation guidelines.</p>
PS.C.28	Flora and Chance found Fauna	<p>The contractor will take reasonable precaution to prevent his workmen or any other persons from removing and damaging any flora (plant/vegetation) and fauna (animal) including fishing in any water body and hunting of any animal.</p> <p>If any wild animal is found near the construction site at any point of time, the contractor will immediately upon discovery thereof acquaint the Environmental Expert of SC / Environment Cell of PWD and carry out the SC's instructions for dealing with the same.</p> <p>The Environmental Expert of SC / Environment Cell of PWD will report to the near by forest office (range office or divisional office) and will take appropriate steps/ measures, if required in consultation with the forest officials.</p>
PS.C.29	Chance Found Archaeological Property	<p>All fossils, coins, articles of value of antiquity, structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislation.</p> <p>The contractor will take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. He will, immediately upon discovery thereof and before removal acquaint the Environmental Expert of SC / Environment Cell of PWD of such discovery and carry out the SC's instructions for dealing with the same, waiting which all work shall be stopped.</p> <p>The SC will seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site.</p>
PS.C.30	Labour camp management - Accommodation	<p>Contractor will follow all relevant provisions of the Factories Act, 1948 and the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp.</p> <p>The location, layout and basic facility provision of each labour camp will be submitted to SC and PWD</p>

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		<p>prior to their construction. The construction will commence only upon the written approval of the Environmental Expert of SC / Environment Cell of PWD. The contractor will maintain necessary living accommodation and ancillary facilities in functional and hygienic manner and as approved by the SC.</p>
PS.C.31	Labour camp management - Potable Water	<p>The Contractor will construct and maintain all labour accommodation in such a fashion that uncontaminated water is available for drinking, cooking and washing. The Contractor will also provide potable water facilities within the precincts of every workplace in an accessible place, as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. The contractor will also guarantee the following:</p> <ol style="list-style-type: none"> a) Supply of sufficient quantity of potable water (as per IS) in every workplace/labor camp site at suitable and easily accessible places and regular maintenance of such facilities. b) If any water storage tank is provided that will be kept such that the bottom of the tank at least 1mt. from the surrounding ground level. c) If water is drawn from any existing well, which is within 30mt. proximity of any toilet, drain or other source of pollution, the well will be disinfected before water is used for drinking. d) All such wells will be entirely covered and provided with a trap door, which will be dust proof and waterproof. e) A reliable pump will be fitted to each covered well. The trap door will be kept locked and opened only for cleaning or inspection, which will be done at least once in a month. f) Testing of water will be done every month as per parameters prescribed in IS 10500:1991. <p>Environmental Expert of SC / Environment Cell of PWD will be required to inspect the labour camp once in a week to ensure the compliance of the EMP.</p>
PS.C.32	Labour camp management - Sanitation and Sewage System	<p>The contractor will ensure that - the sewage system for the camp are designed, built and operated in such a fashion that no health hazards occurs and no pollution to the air, ground water or adjacent water courses take place separate toilets/bathrooms, wherever required, screened from those from men (marked in vernacular) are to be provided for women</p>

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		<p>adequate water supply is to be provided in all toilets and urinals all toilets in workplaces are with dry-earth system (receptacles) which are to be cleaned and kept in a strict sanitary condition Night soil is to be disposed off by putting layer of it at the bottom of a permanent tank prepared for the purpose and covered with 15 cm. layer of waste or refuse and then covered with a layer of earth for a fortnight.</p>
PS.C.34	Labour camp management - Waste Disposal	<p>The contractor will provide garbage bins in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner as per the Comprehensive Solid Waste Management Plan approved by the Environmental Expert of SC / Environment Cell of PWD. Unless otherwise arranged by local sanitary authority, arrangements for disposal of night soils (human excreta) suitably approved by the local medical health or municipal authorities or as directed by Environmental Expert of SC / Environment Cell of PWD will have to be provided by the contractor.</p>
PS.C.35	Clean-up Operations, Restoration and Rehabilitation	<p>Contractor will prepare site restoration plans, which will be approved by the Environmental Expert of SC / Environment Cell of PWD. The clean-up and restoration operations are to be implemented by the contractor prior to demobilization. The contractor will clear all temporary structures; dispose all garbage, night soils and POL waste as per Comprehensive Waste Management Plan and as approved by SC. All disposal pits or trenches will be filled in and effectively sealed off. Residual topsoil, if any will be distributed on adjoining/ proximate barren land or areas identified by Environmental Expert of SC / Environment Cell of PWD in a layer of thickness of 75 mm-150 mm. All construction zones including river-beds, culverts, road-side areas, camps, hot mix plant sites, crushers, batching plant sites and any other area used/affected by the project will be left clean and tidy, at the contractor's expense, to the entire satisfaction to the Environmental Expert of SC / Environment Cell of PWD.</p>

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PS.O. OPERATIONAL STAGE		
PS.O.1	Monitoring Operation Performance	The PWD will monitor the operational performance of the various mitigation/ enhancement measures carried out as a part of the project. The indicators selected for monitoring include the survival rate of trees; utility of enhancement provision for relocated temples, schools and other relocated structures; status of rehabilitation of borrow areas; and utility of noise barriers.
PS.O.2	Maintenance of Drainage	PWD will ensure that all drains (side drains, median drain and all cross drainages) are periodically cleared especially before monsoon season to facilitate the quick passage of rainwater and avoid flooding. PWD will ensure that all the sediment and oil and grease traps set up at the water bodies are cleared once in every three months.
MA. O.3	Pollution Monitoring	The periodic monitoring of the ambient air quality, noise level, water (both ground and surface water) quality, soil pollution/contamination in the selected locations as suggested in pollution monitoring plan will be responsibility of PWD. PWD will appoint PCB approved pollution monitoring agency for this purpose.
MA. O.4	Atmospheric Pollution	Ambient air concentrations of various pollutants shall be monitored as envisaged in the pollution-monitoring plan. Roadside tree plantation will be maintained.
PS.O.5	Noise Pollution	Noise pollution will be monitored as per monitoring plan at sensitive locations. Noise control programs are to be enforced strictly. Monitoring the effectiveness of the pollution attenuation barriers, if there is any, will be taken up thrice in the operation period.
PS.O.6	Soil Erosion and Monitoring of Borrow Areas	Visual monitoring and inspection of soil erosion at borrow areas, quarries (if closed and rehabilitated), embankments and other places expected to be affected, will be carried out once in every three months as suggested in monitoring plan.
PS.O.7	Changes in Land Use Pattern	PWD shall take initiative and act as facilitator to prepare an action plan for balanced regional development in consultation with Local Development Authority and State Government to control the ribbon

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		<p>development along the project road including new bypasses. A land use regulation control, if applicable need to be adopted.</p> <p>A land use-zoning map may be developed, under which up to a particular distance from the ROW of the alignment especially in new bypass stretches, no development will be allowed.</p> <p>Necessary hoardings will be erected indicating the availability of ROW and legal charges for encroachment of ROW. Budgetary provisions are to be made to control the ribbon development along project road.</p>

REHABILITATION AND RESETTLEMENT POICY OF GOVERNMENT OF KERALA

Introduction and Objectives

Land Acquisition in Kerala is carried out under the provisions of the Land Acquisition Act 1894. This being a Central Act, State Government has powers only to implement rehabilitation package to supplement the compensation awarded under the provisions of this Act. The State Government has made some arrangements in this direction by introducing a fast track mechanism for land acquisition; which has ensured a better compensation to the evictees.

When adequate or suitable public land is not available for any specific public purpose including infrastructure and development projects, Government has to resort to land acquisition. Often families get displaced from their ancestral personal properties and also lose their land or premises that provide them their income. Kerala is a State with high population density. The State's growth structure makes some areas extended habitation continuum with no clear boundary between the rural and the urban. It is in this context that a Comprehensive Relief, Resettlement and Rehabilitation Policy has become essential.

2. Aims & Objectives of the Relief, Resettlement and Rehabilitation Policy

Government aims to ensure the following through the Relief, Resettlement and Rehabilitation Policy;

- a) The project affected persons (PAP's) are provided with a just and reasonable compensation.
- b) Where the negative impact are unavoidable, the project affected persons are to be assisted in ensuring that their socio-economic status does not fall below what it was before the acquisition.
- c) People's participation shall be ensured in the acquisition of land and in the implementation of the project so that there is transparency and openness and the PAPs are made stakeholders to the extent possible.
- d) The project is implemented without causing any major disruption or disturbance to the daily lives of the PAPs and the negative effect of having to be displaced from their land can be minimized.
- e) Before taking possession of the acquired land and property, disbursement of all compensation is ensured.

3. Basic Framework of the Policy

The Relief, Resettlement & Rehabilitation Policy of the Government of Kerala includes the following;

- 1) Any Land Acquisition should be for a declared and established public purpose and the 'Public Purpose' should be clearly defined right at the commencement.
- 2) Land Acquisition should commence based on a project proposal that should indicate the total area required to be acquired and why the acquisition has become necessary. A High Level Committee headed by the Chief Secretary, Secretary (Revenue) and the Secretary of the Administrative Department shall assess the project, its viability and extent of land required. The Administrative Department will have to submit before this Committee a detailed project elucidating the kind and extend of land to be acquired. Land Acquisition will commence only after the approval of the project by the Committee.
- 3) The Administrative Department shall carry out Social Impact Assessment in the prescribed proforma before Land Acquisition commences and the report shall be submitted before the High Level Committee. A Social Impact Assessment Study shall be conducted in the case of acquisition for projects as recommended by the High Level Committee. Clear guidelines on the functioning of the High Level

- Committee will be laid down including where Social Impact Assessment Study is necessary.
- 4) The Project Affected Persons (PAPs) shall be informed about the details and purpose of the project in a form and manner that is comprehensive to the common-man.
 - 5) Section 4 (1) Notification shall be issued only after issue of Administrative Sanction by the Administrative Department for the project that has got the approval of the High Level Committee.
 - 6) A District Level Purchase Committee (DLPC) is constituted in every district. The DLPC would decide the classification and value of lands based on market value of land after negotiations with land owners. The DLPC members would be as follows:
 - (i) District Collector – Chairman
 - (ii) Concerned RDO/Sub Collector
 - (iii) Finance Officer, Collectorate
 - (iv) A representative of Requisitioning Agency, not below the rank of a District Level Officer.
 - (v) Deputy Collector in charge of Land Acquisition.
 - 7) The value of land would be approved by the Government after approval by a State Level Empowered (SLEC), based on the recommendation of the DLPC. The SLEC would include:
 - (i) Chief Secretary - Chairman
 - (ii) Revenue Secretary
 - (iii) Secretary of the Administrative Department
 - (iv) Law Secretary
 - (v) Finance Secretary
 - 8) Urgency clause shall be invoked only in the rarest of rare cases, with the recommendation of the High Level Committee and only with adequate justification.
 - 9) Land acquired should be utilized within three years, failing which the land will be taken over by the Government in Revenue Department and assigned for any other public purpose. The High Level Committee shall have the authority to condone the delay where justified.
 - 10) No 'de novo' process shall be initiated unless the High Level Committee condones the delay and responsibility foxed for the process becoming 'de novo'.
 - 11) Section 4(1) notification shall be issued only after at least 25% of the LA cost is deposited in the Land Acquisition Officer's Account.
 - 12) The compensation payable includes: the land value based on a negotiated price and the value of the structures without depreciation.
 - 13) A family rendered landless and homeless with no salaried income whose annual income is below Rs.75,000/- shall be provided upto 3 cents of land.
 - 14) In employment generating projects, providing jobs with permanent income to one member of the out see family may be considered by the Requisitioning Authority.
 - 15) House rent grant should be paid for a minimum period of 6 months to the PAP who loses his home which he and his family were occupying and who have no other house.
 - 16) Tenants in occupation for a minimum 3 years who lose their source of income will be paid a one-time allowance. Roadside vendors and other small scale industries shall be covered in this category.
 - 17) In cases where the title is not clear or in cases where the land value decided by the DLPC is not acceptable to the land owner, further land acquisition as permissible shall be carried out under the provision of Land Acquisition Act 1894 or NHAI Act, as the case may be.

4. **Alternate Methodologies**

The Government also propose to try out the following alternate methodology for land acquisition in specific cases depending upon their applicability as per the recommendation of the Cabinet Sub Committee.

- For developmental and infrastructure projects, the PAP shall also be given a chance to become shareholders in the upcoming project and offered with stocks up to the value of the land acquired in lieu of the compensation.
- The LSG institutions shall give priority to the PAP tenants who were running shops and other business establishments, in assignment of commercial space in PRI run commercial complex.
- Where the land owner whose land is acquired, is left with less than 50% of his land and is willing to have the balance land also acquired, Government will acquire such land and utilize it for public purpose.
- In the case of every acquisition, the owner who loses his entire land will be given the option to claim either the compensation or to take 25% of the quantum of land acquired from him as compensation, in the vicinity of the project site or along the new or widened road. This will enable the PAP to get advantage of the land value appreciation that will take place with the advent of the project.

5. **Resettlement and Rehabilitation**

Government will ensure that land owners who lose their land and other assets through land acquisition get compensation and resettlement in the manner specified under each category of project. The rate of compensation for all land acquisition cases is given in the Annexure.

5.1 **Land Acquisition for Special Projects Other than Roads**

- i) Land Value shall be based upon the Basic Land Value arrived at by the DLPC & SLEC
- ii) Value of Construction will be assessed without depreciation.
- iii) Where the project affected person (PAP) is rendered homeless and income of the family is below Rs.75,000/- per annum, alternate land of 3 cents per family shall be assigned for rehabilitation. Such land will be acquired as part of the project and it will be adjacent or close to the project site. This is to ensure that the project affected persons also benefit from the increase in land value and from the developmental activities that take place in the vicinity. The basic amenities viz. power, water and road to rehabilitation site shall be provided, the cost of which shall be borne by the Requisitioning Agency/Department. Such development site shall be handed over to the project affected persons simultaneously with the take over of the acquired land.
- iv) Where the Requisitioning Authority is a Public Sector Undertaking, action shall be taken to provide employment to one member of the family to the extent feasible.
- v) The Requisitioning Agency or the Local Self Government institution should construct shopping Complex on land acquired for this purpose at the cost of the Requisitioning Authority and commercial space should be provided to those displaced from their shops/business centres at a nominal rent for a period of five years. This benefit is meant for the small commercial establishment and shall not be available for companies, banks, financial, agencies, PSUs, showrooms, shopping malls etc.

- vi) Upto 10% of the land acquired may be earmarked for rehabilitation of project affected persons.
- vii) Option could be provided to project affected persons to claims compensation or to get 25% of the land acquired from him (with a maximum extent fixed by the High Level Committee) assigned to him in the vicinity of the project area.

5.2 **Land Acquisition for Road Projects**

Kerala, with its linear type development along the existing roads, widening of roads requires linear acquisition which is bound to displace a large number of residential and commercial properties, structures, institutions and other establishments. Since commercial tenants and employees in such places and encroachers are not generally entitled to any legal compensation, the Government is of the view that persons/families falling in these categories also deserve special attention and cannot be ignored, primarily in those cases where these persons/families fall in the category of Economically weaker section. Such persons also shall therefore be assisted under the following package;

- i. Land value shall be determined based on the Basic Land valued arrived at by DLPC & SLEC.
- ii. Value of constructions and improvements shall be assessed without depreciation.
- iii. Where the project affected person is rendered homeless and income or the family is below Rs. 75,000/- per annum, alternate land of 3 cents per family shall be assigned for rehabilitation. The basic amenities viz. power, water and road to Rehabilitation site will be provided.
- iv. Local Self government institutions should endeavour to construct shopping complex to rehabilitate displaced small shop keepers for this purpose. Commercial space should be provided to small-scale commercial vendors displaced from their shops/ business centers on a priority basis. This benefit will not be available to companies, banks, large shops, financial agencies, PSUs Shopping Malls etc.,
- v. Option could be provided to project affected persons (PAPs) to claim compensation or to get 22% of the land acquired from him/ her (with a maximum extent fixed by the High Level Committee) assigned to him in the vicinity of the newly-formed road.

5.3 Land Acquisition for National Highways:

Land Acquisition for National Highways will be carried out in accordance with the NHAI Act. However, the Rehabilitation package formulated by the State Government will be applicable for the land acquisition for NH also. Rehabilitation Committee to DLPC constituted under the chairmanship of the District Collector will hear the complaints regarding rehabilitation and take remedial measures. A State Level Committee comprising of the Secretaries of PWD and Revenue and the representatives of NHAI, PWD Chief Engineer will scrutinize the complaints and take decisions thereon.

5.4 Irrigation Project

Land Acquisition policy as explained above will be applicable in the case of Irrigation Projects also. The Project affected persons (PAPs) with land rights will be given the option of getting up to 50% of the land (with a maximum extent fixed by the High Level Committee) acquitted from them in the command area, in lieu of compensation.

6. Categorization of Project Affected Persons

1. Those who lose only land and residential structures but are not residing there
2. Those who lose land and residential structures and are residing there
3. Land holders who have given their commercial structure for rent
4. Those that lose commercial structures and are themselves running the commercial establishments.
5. Residential tenants
6. Commercial tenants running establishment for at least 3 years.

7. Employees working in commercial establishments for at least 3 years.
8. Encroachers who live or run their small business on puramboke land for a minimum period of 3 years
9. Places of worship/ Socio-cultural and Education centers.

7. Institutional Mechanism for Implementation

Each project will have a resettlement and rehabilitation cell with a Rehabilitation Officer, who will co-ordinate the R&R activities. In the districts, the District Collector or his representative will act as the R&R officer. The High Level Committee headed by the Chief Secretary will co-ordinate the R&R activities in the State.

8. Kerala Infrastructure Bonds

Besides the land acquisition policy adverted above, Government is actively considering a novel idea of assigning Kerala Infrastructure Bonds in lieu of compensation in full or part which may aid the PAPs to avail themselves of the hike in land price in future. This shall be assigned for study and report within six months by an expert committee since the Model calls for better clarity regarding assessment of land value, transfer of bonds identifying implementing agency and the structures that need to be in place for implementing such a model.

Annexure

Proposed compensation package

- i. Those who lose only land residential structures but are not residing there :
 - a. Land value determined by the DLPC
 - b. Structure value without depreciation.
- ii. Those who lose land and residential structures and are residing there:
 - a. Land value determined by the DLPC
 - b. Structure value without depreciation
 - c. Rent at Rs. 5,000/- per month for 6 months from the date of takeover of the land or till the compensation is paid whichever is later.
 - d. Shifting allowance of Rs. 25,000/-
- iii. Those whose land and commercial structures are acquired but who are not running these themselves:
 - a. Land value determined by the DLPC
 - b. Structure value without depreciation.
- iv. Those who lose commercial structures and are themselves running the commercial establishments:
 - a. Land value determined by the DLPC
 - b. Structure value without depreciation.
 - c. Rent at Rs. 5,000/- per month for 6 months
 - d. Shifting allowance of Rs.25,000/0
- v. Residential Tenants:
 - a) Rent @ 5,00/- per month for 6 months
 - b) Shifting allowance of Rs.25,000/-
- vi. Commercial Tenants:
 - a) One time assistance Rs.2,00,000/- to meet all shifting charges and social costs. However, such assistance would not be provided to companies, banks, financial institutions and large shops, shopping malls, etc.
- vii. A maximum of two employees working in commercial establishments who have been working for a minimum period of three years will apply only for small establishments excluding banks, financial institutions, companies, malls etc. would be given:
 - a) Rs.6,000/- per month for 6 months for loss of livelihood.
- viii. Encroachers who live or run their small business on puramboke land for a minimum period of 3 years.
 - a) Rs.6,000/- per month for 6 months for loss of livelihood

- b) Cost of structure subject to a minimum of Rs.25,000/-
 ix. Socio-Cultural & Educational Centres or place of worship:
 a) Land Value determined by the DLPC
 b) Structure Value.

Annexure 1202B: Social Screening Format for Categorization of Social Impact

Part A

Name of the Department: _____

Name of the Circle: _____

Name of Division: _____

Districts covered by the Project: _____

Name of Sub division Responsible: _____

Name & Address of the Officers Responsible

(i) Superintending Engineer: _____

(ii) Executive Engineer: _____

(iii) Sub Divisional Engineer: _____

Category of Project: _____

Part B

(Please tick mark (√) in the appropriate column and provide relevant information in Col.6)

Sl. No	Screening Questions	Probable social Impacts			Extent/Number/Remarks
		Yes	No	Possible	
1	2	3	4	5	6
1	Is land acquisition necessary?				
2	Is the ownership status and current usage of the land known?				
3	Will there be loss of agricultural plots?				
4	Will there be loss of seasonal crops?				
5	Will there be loss perennial crops (yielding and/or fruit bearing and other trees)?				
6	Will the project displace residential structures (Houses)?				
7	Will the project displace commercial structures (shops workshops, factory and other establishments)?				
8	Will there be loss of structures other than buildings? (Compound wall/gate/water tanks/ slabs/ wells/ septic tanks, etc				
9	Are any cultural properties (place of worship, religious structure, memorial, monument, cemetery, etc) affected or				

	displaced?				
10	Are any community properties affected or displaced?				
11	Are any tenants running enterprises or operating from the structures that would be displaced?				
12	Are there any tenants residing in the structures that would be displaced?				
	Are there residential squatters within the right of way?				
13	Are there commercial squatters within the right of way?				
14	Are there residential and commercial squatters within the right of way?				
15	Will there be loss of incomes and livelihoods of employees of affected establishments/ structures?				
16	Will people lose access to common facilities, services, or natural resources?				
17	Will there be loss of existing access to private properties and services?				

1. Social Screening sheet must be completed by all projects at Investigation Stage and forwarded to social cell for review, verification and records

Date	Signature and Name of the Officer Responsible
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Annexure 1202C: Social Impacts Data Sheet– to be attached with investigation Report

S. No.	Category of the Affected	Number of households/ Families	Number of persons affected	Extent of Land Involved	Number of structures
A	Private Land with Legal Ownership (Titleholders)				
	Residential properties				
	Commercial Properties				
	Residential & Commercial Properties				
	Agricultural Land				
	Vacant Land (urban)				
	Vacant Land (rural)				
	Other categories of private land (specify)				
B	Non-Titleholders attached to Private Properties				
	Tenants –Residential				
	Tenants – commercial				
	Employees				
C	Cultural Properties (with Legal ownership)	Number			
	Land only				
	Land and structure (specify)				
D	Cultural Properties (without Legal ownership) of squatter status	Number	Number of persons affected	Extent of land involved	Number of structures involved
	Shrine				
	Hundi (Boxes to receive offerings)				
	Others (specify- arch, gate, c/wall, etc)				
E	Government /Public sector/Panchayat Properties				
	Land only				
	Land with minor structure				
	Land and building				
F	Community Properties				
	Land only				
	Land with minor structure				
	Land and building				
	Land and some public utility (specify eg. well)				
G	Squatters (Non-titleholders)				
	Residential				
	Commercial				
	Residential & commercial				

Annexure 1202D: **Budget Estimate to be attached with Detailed Project Report**

S. No.	Item	Total Units (specify)	Unit Cost (Rs)	Estimated Replacement Cost
1	Private Land Value (specify category)			
1 (a)				
1 (b)				
2	Structure value of (specify type) as per BSR of PWD			
2 (a)				
3	Compensation towards other immovable properties			
R and R Assistance and Activities				
1	Shifting assistance			
2	Transitional allowance to those whose livelihood is affected			
3	Additional assistance to vulnerable groups 3 women headed households			
4	Documentation			
5	Operational costs			
6	Consultancy charges			
	Total			

Sample SIA for S-1 & S-2 category (Table of Contents)

Executive Summary

Chapter I : THE PROJECT AND SCOPE OF LAND ACQUISITION

- 1.1 Introduction
- 1.2 Objective of the Study
- 1.3 The Project and Project Site
- 1.4 Public Consultation
- 1.5 Efforts to Minimize Negative Impacts
- 1.6 Extent of Land Acquisition

CHAPTER II: SOCIAL ASSESSMENT OF PROJECT AFFECTED

- 2.1 Census Survey
- 2.2 Population Profile
- 2.3 Vulnerable Population
- 2.4 Magnitude of displacement
- 2.5 Loss of Immovable Properties
- 2.6 Loss of Livelihood
- 2.7 Gender Impacts
- 2.8 Analysis of Alternatives

CHAPTER-III MITIGATION MEASURES

- 3.1 Targeting Vulnerable Groups
- 3.2 Resettlement and Rehabilitation (R&R) Package
- 3.3 Entitlement Criteria and Frame work
- 3.4 R&R Budget

CHAPTER IV: MONITORING AND MANAGEMENT

- 4.1 Institutional Mechanism for Implementation and Monitoring
- 4.2 Criteria for Inclusion on PAP List
- 4.3 Methods for determining compensation
- 4.4 Appeal Procedures and Grievance Redressal Mechanism
- 4.5 Procedure and Mode of delivery of compensation and assistances
- 4.6 Monitoring and Evaluation System

The SIA report for S-2 Category Project shall pride the following:

- Screening
- Transect walk proceedings,
- Analysis of alternatives
- Consultation proceedings,
- Impact Statement,
- Census and socio-economic survey form,
- Micro plan and short resettlement Plan,
- Land Acquisition Plan.
- Budget

Outline for Full Resettlement Plan

CHAPTER I: SCOPE OF LAND ACQUISITION AND RESETTLEMENT

- ❖ What the project is all about and why land acquisition is necessary. Maps, charts and sketches may be used to illustrate the point.

CHAPTER II: SOCIO ECONOMIC INFORMATION

- ❖ Define, identify and enumerate the affected people. Describe the possible impacts of land acquisition by the project on people being affected. Explain the social, cultural and economic impacts of land acquisition on the community.
- ❖ Identify all losses of people and quantify them. Special attention must be given to the identify the impact of the project on the poor and the vulnerable population such as the SCs and STs, women and women headed families. Suggest special measures within the policy framework to restore fully and to enhance their economic and social base.

CHAPTER III: OBJECTIVES, POLICY FRAMEWORK AND ENTITLEMENTS

- ❖ Explain the purpose and objectives of land acquisition and resettlement. Describe relevant national and state policy pertaining to resettlement and rehabilitation applicable to the project and the relevant portion of the LA act
- ❖ Prepare entitlement matrix for all categories of loss including compensation rates and eligibility criteria.
- ❖ If the project is financed by any bilateral agency, their policy requirements should be accommodated and explained in this chapter.

CHAPTER IV: PUBLIC CONSULTATION, PARTICIPATION AND GRIEVANCE REDRESS

- ❖ Identify project stakeholders, describe mechanisms used to ensure active participation of the primary, secondary and tertiary, etc. of stakeholders in the planning, implementation, management, monitoring and evaluation of the development project and the resettlement and rehabilitation component.
- ❖ Identify local organizations and institutions and suggest ways and means to support the affected population
- ❖ Establish procedures for public consultation and redress of grievances of the affected population.

CHAPTER V: RELOCATION OF HOUSING AND SETTLEMENTS

- ❖ Identify relocation options for all structures including housing, commercial establishments, cultural and community properties including cash compensation and self-relocation. Specify measures to assist with transfer and establishment at new sites
- ❖ In extreme cases specify measures to include resettlement sites in land acquisition.
- ❖ Specify means to safeguard livelihoods of the affected population.
- ❖ Identify and suggest concrete measures to address gender issues and others related to vulnerable groups
- ❖ Identify cultural and environmental risks precipitated by land acquisition and displacement and measures to manage and monitor.

CHAPTER VI: INCOME AND LIVELIHOOD RESTORATION STRATEGY

- ❖ Identify livelihoods at risk. Develop income restoration strategy with options to restore all types of livelihoods.
- ❖ Specify job opportunities and job creation plan; provision for compensating loss of livelihood, retraining and skill up gradation for self-employment.
- ❖ Prepare plan to relocate and restore business including income substitution.

CHAPTER VII INSTITUTIONAL FRAMEWORK

- ❖ Identify various tasks from planning land acquisition to resettlement and allocate responsibilities showing implementation schedule
- ❖ Review capacity building requirements and provide for assistance including technical and managerial skills to manage the tasks at hand
- ❖ Specify role of NGOs if required for resettlement planning and management

CHAPTER VIII RESETTLEMENT BUDGET AND FINANCING

- ❖ Identify land acquisition and resettlement costs
- ❖ Prepare annual budget and specify timing for release of funds

CHAPTER IX IMPLEMENTATION SCHEDULE

- ❖ Prepare a time schedule showing start and finish dates for land acquisition and resettlement tasks.
- ❖ Show how affected people will be provided before demolition of structures.

CHAPTER X MONITORING AND EVALUATION

- ❖ Prepare internal monitoring plan for land acquisition and resettlement with targets and key indicators of progress, mechanism for reporting and resource requirements.
- ❖ Prepare evaluation plan with provision for external independent evaluation for bilateral funded projects.
- ❖ Specify participation of affected people in monitoring and evaluation.

Outline for Short Resettlement Plan

Chapter 1: Scope of Land Acquisition and Resettlement

Describe alternative options considered to minimize land acquisition and displacement. Explain why the remaining effects (land acquisition and displacement if any) are unavoidable. Give a summarized version of the key effects, the extent of land acquired, the assets people would lose and the people displaced from homes or from their livelihoods or occupations.

Chapter 2: Objectives, Policy framework and Entitlements

Describe the resettlement policy of the State which provides resettlement benefits to mitigate the negative impact and the details of entitlements of the project affected persons and families

Chapter 3: Public Consultation, People’s Participation and Grievance Redress

Describe consultation process and procedures, how the project will ensure participation of the affected people in the awareness programs on the proposed project, the processes of land acquisition and resettlement and how their grievances will be redressed.

Chapter 4: Compensation, Relocation and Income/Livelihood Restoration

Describe arrangement for valuing and disbursing compensation. Explain the arrangements that would be made for relocation of housing and shifting of establishments. Describe livelihood restoration measures to be implemented, as to how, when, where and by whom, and the mechanism to monitor the processes and time-bound progress.

Chapter 5: Institutional Framework

Identify main tasks and responsibilities related to planning, implementing and monitoring land acquisition and resettlement.

1500 A. Design of Roads

All major PWD roads shall be designed in accordance with the relevant IS/IRC codes and practises. For this purpose the following list of codes may be made referred.

1. IRC: 32-1969 Standard for Vertical and Horizontal Clearances of Overhead Electric Power and Telecommunication Lines as Related to Roads
2. IRC: 38-1988 Guidelines for Design of Horizontal Curves for Highways and Design Tables (First Revision)
3. IRC: 39-1986 Standards for Road-Rail Level Crossings (First Revision)
4. IRC: 41-1997 Type Designs for Check Barriers (First Revision)
5. IRC: 54-1974 Lateral and Vertical Clearances at Underpasses for Vehicular Traffic
6. IRC: 65-1976 Recommended Practice for Traffic Rotaries
7. IRC: 66-1976 Recommended Practice for Sight Distance on Rural Highways
8. IRC: 69-1977 Space Standards for Roads in Urban Areas
9. IRC: 73-1980 Geometric Design Standards for Rural (Non-Urban) Highways
10. IRC: 80-1981 Type Designs for Pick-up Bus Stops on Rural (i.e., Non-Urban) Highways
11. IRC: 86-1983 Geometric Design Standards for Urban Roads in Plains
12. IRC: 92-1985 Guidelines for the Design of Interchanges in Urban Areas
13. IRC: 98-1997 Guidelines on Accommodation of Underground Utility Services Along and Across Roads in Urban Areas (First Revision)
14. IRC: 99-1988 Tentative Guidelines on the Provision of Speed Breakers for Control of Vehicular Speeds on Minor Roads
15. IRC: 103-1988 Guidelines for Pedestrian Facilities
16. IRC: SP: 12-1973 Tentative Recommendations on the Provision of Parking Spaces for Urban Areas
17. IRC: SP: 23-1983 Vertical Curves for Highways
18. IRC: SP: 41-1994 Guidelines on Design of At-Grade Intersections in Rural & Urban Areas
19. IRC: 58-2002 Guidelines for the Design of Plain Jointed Rigid Pavements for Highways (Second Revision)

Latest Revision of relevant codes shall be followed.

1501. Classification of roads

The roads under PWD are classified as Expressways, National Highways (NH), State Highways (SH), and Major District Roads (MDR) as detailed below,

(a) Expressways: The function of Expressways is to cater for movement of heavy volumes of motor traffic at high speed. They connect major points of traffic generation and are intended to serve trips of medium and long length between large residential areas, industrial or commercial concentration and the central business districts.

(b) National Highways (NH): These are main highways running through the length and breadth of the country connecting major ports, highways of neighbouring countries, state capitals. These are the highways connecting major ports, industrial and tourist centres within the state and neighbouring states.

©**State Highways (SH):** These are arterial routs of a state linking district head quarters and important cities within the state and connecting them with National Highways to the neighbouring state.

(d) Major District Roads (MDR): These are important roads within a district serving areas of production/markets and connecting these with each other or with the main highways.

1502. Design Parameters

The main parameters involved in the design of any road is the traffic volume it has to cater to, the speed at which the traffic flows, and the safety of vehicles in terms of sight distance considerations.

1502.1. Speed: The design speed is the expected 95th percentile speed of the motorised traffic on the new road in the design year. The 95th percentile speed is the speed, which only 5% of vehicles will exceed. The choice of design speed has a big influence on key aspects of highway design, especially curvature.

In practice it is rarely possible to adopt a uniform design speed for the whole road - design speeds need to vary from section to section to reflect differences in the road environment, terrain, etc. IRC SP 73 specifies the design speeds for different types of terrain.

1502.2. Volume: Traffic data is critically important in the design of roads. Traffic surveys must cover motorised as well as non-motorised traffic. For new roads on completely new alignments it will be necessary to assign traffic to them from existing roads and then make an allowance for generated traffic. Usually mixed traffic volumes are expressed in PCU. The PCU factor for various vehicle types are available in IRC 73 and the PCU ranges for various class of roads are in IRC 86

1502.3. Sight distance: The need to achieve minimum sight distance standards sets limits on how sharp the curves can be. The details of sight distance for horizontal curves and vertical curves are given in IRC 73 and IRC SP 23 respectively. In the case of Rural Highways, IRC 66:1976 may be referred. There are three main types of sight distance to consider: Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD) Intermediate Sight Distance (ISD).

1502.4. Stopping Sight Distance. This is the visibility necessary for a driver to be able to see an obstruction in time to bring the vehicle to a halt without a collision. This is a basic minimum standard for two-lane single carriageway roads. It is assumed that the driver's eye height is 1.2m and the height of the obstruction is at least 0.15m above the road surface.

1502.5. Overtaking Sight Distance: This is the visibility necessary for a driver to be able to see whether the road ahead is sufficiently clear to enable him to overtake a vehicle in front – even if an oncoming vehicle appears after he has started the overtaking manoeuvre. It is a very long distance, especially at the higher speeds, and it can be difficult to achieve.

1502.6. Intermediate Sight Distance: This is the visibility necessary for a driver to be able to see whether the road ahead is sufficiently clear to enable him to overtake, assuming that he will abort the manoeuvre if an oncoming vehicle appears before he has got level with the slower vehicle. ISD is much less than OSD yet it permits reasonably safe overtaking. ISD is about twice SSD. It is assumed that the observer and the obstruction are at eye height (1.2m).

1502.7. Geometric Design Standards: Geometric Design Standards for Urban Roads in Plains shall be as per IRC: 86-1983 and for Rural (Non-Urban) Highways as per IRC: 73-1980. The space standards for Roads in Urban Areas shall be IRC: 69-1977. In the case of Hill Roads Recommendations About the Alignment Survey and Geometric Design of Hill Roads IRC: 52-2001 may be followed. Appendix 3.4 gives the standards for roads in Kerala.

1503. Cross Sectional Elements

1503.1. Building lines, Control lines, Land width, ROW

Desirable land width in metre for different classes of roads is indicated in Appendix 3.4. The same is also shown in Figure 3.1

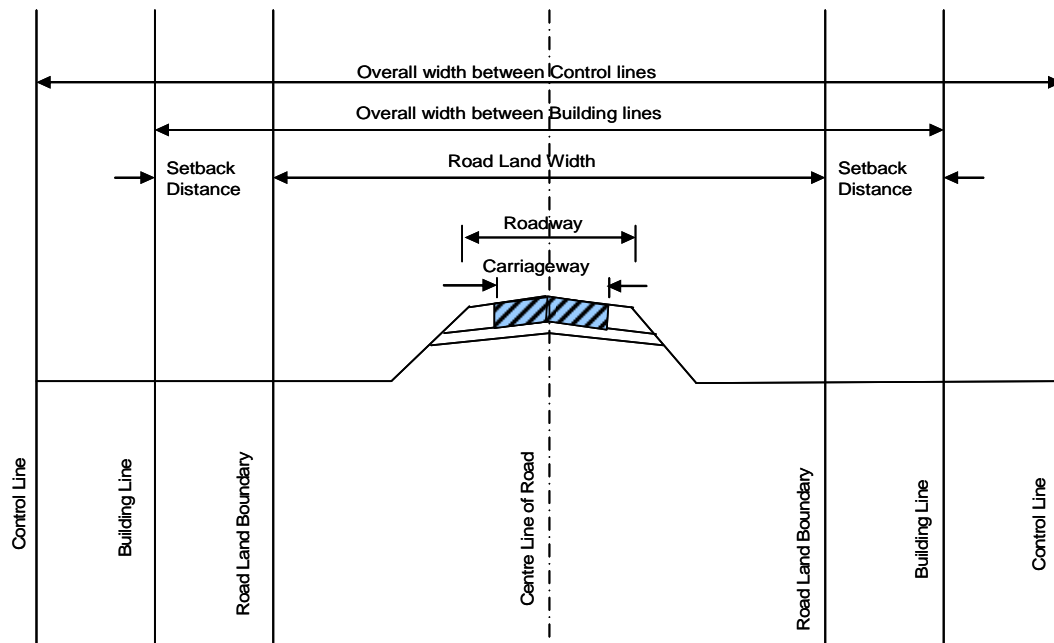


Figure 3.1: Road Terminology

1503.2. Camber or Cross Fall

Carriageway cross fall must be sufficient to provide good surface drainage, without causing problems for drivers. On two-way single carriageway roads the carriageway is normally cambered to form an inverted ‘V’, which may be rounded at its highest point, the crown. On dual carriageway roads the carriageway normally slopes away from the median.

At curves the carriageway and shaller profile may change. Shallers having the same surface as the carriageway may have the same cross fall, but generally shaller cross falls will be a little steeper - normally 5%. The cross falls for different type of pavement surfaces are provided in IRC 73

1503.3. Shaller

Shallers are essential for safety, to ensure capacity utilisation, and must be provided on all roads. Shallers along Highways must ideally be paved in order to be durable and perform effectively in all weathers. This can be achieved either by extending the main pavement or using a different construction, such as double bituminous seal treatment. Generally, the width of Shallers will be one half- the difference between the roadway width and carriageway width.

1503.3.1. Factors to be considered when designing shallers:

- the shaller needs to be strong enough to take all vehicles in any weather and without needing much maintenance
- shallers that are to be used by NMVs and pedestrians must have a good-quality smooth surface – otherwise NMVs and pedestrians will use the carriageway instead
- using a different surface to that of the carriageway makes the shaller look different and this helps emphasise that it has a different function, it is essential to use edge lines (preferably made of thermoplastic) to mark the divide between carriageway and shaller
- there shall be no difference in level between the carriageway and the shaller – an edge drop could discourage smaller vehicles from using the shaller and could be hazardous, especially for motorcyclists.
- On dual carriageway roads there must be a 0.25m wide shaller on the right-hand side of the carriageway next to the median. The divide between the carriageway and shaller must be marked with an edge line.

1503.4. Medians

Medians segregate traffic, provides protection from out-of-control vehicles, reduce glare at nighttime, and acts as pedestrian refuge in urban intersections. For details the chapter on road safety may be referred.

1503.5 Culverts

Culverts must be designed for the entire carriageway width. IRC SP 13 may be referred for details of Culvert design. Typical drawings are also given. IRC SP 20:2002 also details the different type of culverts.

1503.6. Utilities

Provision for Underground Utility Services Along and Across Roads in Urban Areas shall be as per IRC: 98-1997

1503.7. Bus Bays

In the case of highways, bus bays are to be provided to ensure that the other vehicles in the stream are not obstructed due to stoppage of buses. The bus bays are usually of one lane width and the length varies depending on number of buses that stop simultaneously. Details are included in the chapter on Road Safety

1503.8. Footpath:

Roads passing through urban locales with considerable pedestrian traffic must be provided with footpaths. From safety considerations, fencing may be appropriate. IRC 103 shall be referred for pedestrian facilities Details are also included in the chapter on Road Safety.

1503.9. Truck Lay byes

Highways usually cater to long distance truck traffic and facilities shall be provided for their parking. These laybys shall offer resting facilities for the drivers also. Length of lay bye shall be adequate to cater to peak parking demand estimated on volume projections and average delay expected. Details are included in the chapter on Road Safety

1503.10. Passing places

On hill roads, passing places are required to facilitate crossing of vehicles. These shall be provided at the rate of 2 to 3 per km and each shall be of 20 to 30 m length and of 5.5m widths.

1503.11. Lateral and vertical clearances

Lateral clearance is the distance between the extreme edges of the carriageway to the face of the nearest support, whether it is a solid abutment, pier or column.

Vertical clearance stands for the height above the highest point of the travelled way i.e. the carriageway and part of the shallers meant for vehicular use (crown/ super elevated edge) to the lowest point of the overhead structure/ overhangs. For details refer IRC 54. Standard for Vertical and Horizontal Clearances of Overhead Electric Power and Telecommunication Lines as Related to Roads shall be as per IRC:32-1969

1503.12.Embankments

The details of embankment design are given in IRC 36 and IRC SP 20, and the Guidelines for the Design of High Embankments as per IRC: 75-1979

1503.13. Drains

Drains are an integral part of road and must be provided for all roads. These must be permanent structures, considering the heavy monsoons that the state is subjected to. Moreover, these must be properly maintained, as otherwise, the entire road gets damaged. The main objective of drainage is to prevent early damage of the pavement due to entry of excess of water and preventing saturation up to a dept of 1 m below the top of the sub grade. This can be achieved by providing proper drainage. The two types are surface drains and subsurface drains.

Details may be referred in IRC SP 42 and IRC SP 50.

1504. Horizontal Alignment

- The alignment shall be as directional, fluent and matching well with the surrounding topography as possible and also to avoid abrupt changes.
- On new roads, the curve shall be designed to have the large practical radius, generally not less than the ruling value corresponding to ruling design speed given in IRC: 38-1988.

- Absolute minimum values based on minimum design speed may be used where economics of construction and sight conditions so dictates. The radii below absolute minimum shall not be provided
- Straight section exceeding 3 km length must be avoided
- A curvilinear alignment with long curve is better from point of safety and aesthetics.
- Sharp curve shall not be introduced at the end of long tangents, since this can be extremely hazardous.
- Curve shall be sufficiently long and shall have transition curves at either end to eliminate shock due to application of centrifugal force. Deflection angle less than 1° no curve is required to be designed.
- Reverse curves may be needed in difficult terrain. Sufficient length between 2 curves shall be provided for introduction of requisite transition curve.
- To avoid distortion, in appearance, the alignment shall coordinate with longitudinal profile.

1504.1. Horizontal curves

The radius of curvature in horizontal curves is decided by the design speed of the road, side friction. In general Horizontal curves shall consist of a circular portion flanked by spiral transition at both ends. Refer IRC 38 and IRC 73 for details of horizontal curves, extra-widening super-elevation and setback distances.

1505. Vertical Alignment

The general alignment of the road shall follow the terrain as far as possible. Economy and aesthetics are also of importance is choosing the longitudinal profile.

1505.1. Gradient

The rate of rise or fall with respect to the horizontal along the length of road expressed as ratio or a percentage is termed as gradient. Recommended gradients for different terrain conditions are given in IRC 73 and IRC SP 23

1505.2. Vertical Curves

Formula and length of Summit curves and Valley curves are as per IRC SP 23.

1506. Coordination of Horizontal and vertical alignment

Vertical and horizontal curves shall coincide and result in a smooth flowing appearance. If not possible, the horizontal curve shall be somewhat longer than the vertical curve. Sharp horizontal curve shall be avoided. If the horizontal scale is large and the vertical scale is relatively small, it may be satisfactory to include two vertical movements on one long horizontal curve.

Grade and curvature shall be in proper balance. Flat horizontal curves at the expense of steep or long grades or sharp curvature with flat grades shall be avoided.

Broken-back curves (2 curves in same direction with short tangent in between) both in alignment and profile shall be replaced by a single curve.

Proper coordination in this respect will ensure safety improve utility and enhance aesthetics of the road.

1507. Hairpin bends

A hairpin bend may be designed as a circular curve with transition at each end. Alternately, compound circular curves may be provided. The general design criteria are as per IRC 73

1508. Intersections

The design for intersections is based on safety conditions and to cater to peak turning traffic volume. General guidelines to be followed are:

- i) The number of intersections shall be kept at minimum
- ii) If necessary, some minor roads may be connected with each other before joining a major road.
- iii) Geometric layout shall be so selected that hazardous movements by drivers are eliminated. This can be achieved by various techniques such as canalising and staggering.
- iv) The design shall permit the driver to discern quickly either from the layout or from traffic signs, the path he shall follow and the actions of merging and diverging. This can be achieved by a good layout, traffic islands, signs and carriageway markings. Good visibility improves safety.
- v) The number of conflict points shall be minimised.
- vi) Vehicles that are forced to wait in order to cross a traffic stream shall be provided with adequate space at the junctions.

Generally intersections are classified as at grade intersections and Grade separated intersections

a. At grade intersections (Junctions)

The different types of at grade intersections are given in IRC SP 41. Recommended Practice for Traffic Rotaries are as per IRC: 65-1976V

b. Grade Separated intersections

An intersection layout that permits crossing manoeuvres at different levels is known as grade separated intersection or an interchange. These are provided when the traffic volumes on the intersecting arms are too heavy and results in long queues is being formed. Usually these are required in urban intersections where both the roads are equally important. Also from a safety point, those intersections with high accident records may be converted into grade separated intersections. IRC 92 gives the details for interchanges in urban areas.

1509. Sub grade and Pavement

The road structure may be divided into four major components, Viz. Land, Earthwork, pavement and cross drainage works. The types of pavement are

- ✓ Flexible Pavement
- ✓ Rigid Pavement
- ✓ Composite Pavement (Semi rigid and Roller Compacted Concrete)

In case of rural roads, in view of the stage development strategy and the initial cost advantage, the flexible pavement may be the appropriate choice. Generally, the choice of pavement will be further guided by several other factors such as

- ✓ Rainfall and temperature
- ✓ Type and strength of soil along the alignment
- ✓ Availability of good aggregates
- ✓ Availability of Industrial wastes like Fly ash slag etc in the proximity.

In all designs, economies in the initial cost as well as in life cycle costs are crucial and very important. Components of Pavement are detailed in the section on Execution of Road Works.

1510. Design of Flexible Pavement

1510.1. Pavement Thickness: The thickness of pavement is designed on the basis of projected number of commercial vehicles, for the design life using the current commercial vehicles per day and its growth rate. Based on the strength of granular materials that are used, the total design thickness is divided into base and sub-base thickness. The principle criteria for determining the thickness of a flexible pavement with a thin bituminous surfacing is the vertical compressive strain on top of the subgrade imposed by standard axle load of magnitude 8.17 KN (870 Kg) Excessive vertical Subgrade strain causes permanent deformation in the subgrade, which is manifested in the form of rutting on the pavement surface. The minimum recommend pavement thickness is 150 mm. For rigid and semi rigid pavements, tensile stress is taken as design criteria. The detail design for flexible pavement may be as per IRC: 37

1511. Design of Rigid Pavements

The main type of rigid pavement usually practiced is cement concrete pavements and Roller Compacted Concrete Pavements (RCCP). Strict quality control shall be exercised during construction.

Cement Concrete Pavement (CC) Design of cement concrete pavement shall be as per IRC 58. IRC 15 gives the detailing of joints. These may be used in Special cases only where drainage problem is acute and continuous and may be used in limited length. However drainage arrangements shall be ensured even for concrete pavements.

1511.1. Roller Compacted concrete Pavement: RCCP is a technique which makes use laying of zero slump concrete manually and compacting with vibratory or static road roller.

1512. Design of Bridges

1512.1. Introduction

The design of Bridges shall be carried out as per the provisions and recommendations IRC/IS codes as per list below. In case of IRC codes being silent about any design aspect, provisions in IS/ International codes or general practice adopted in DESIGN WING (DRIQ) may be followed.

1512.1.1. List of Codes to be referred for Design of Bridges

1.	IRC: 5-1998	Standard Specifications and Code of Practice for Road Bridges, Section I – General Features of Design (Seventh Revision)
2.	IRC: 6-2000	Standard Specifications and Code of Practice for Road Bridges, Section II – Loads and Stresses (Fourth Revision)
3.	IRC: 18-2000	Design Criteria for Prestressed Concrete Road Bridges (Post-Tensioned Concrete) (Third Revision)
4.	IRC: 21-2000	Standard Specifications and Code of Practice for Road Bridges, Section III – Cement Concrete (Plain and Reinforced) (Third Revision)
5.	IRC: 22-1986	Standard Specifications and Code of Practice for Road Bridges, Section VI – Composite Construction (First Revision)
6.	IRC: 24-2001	Standard Specifications and Code of Practice for Road Bridges, Section V – Steel Road Bridges (Second Revision)
7.	IRC: 40-2002	Standard Specifications and Code of Practice for Road Bridges, Section IV – Brick, Stone and Block Masonry (Second Revision)
8.	IRC: 78-2000	Standard Specifications and Code of Practice for Road Bridges, Section VII – Foundations and Substructure (Second Revision)
9.	IRC: 83-1999	Standard Specifications and Code of Practice for Road Bridges, Section IX – Bearings, Part I : Metallic Bearings (First Revision)
10.	IRC: 83-1987 (Part II)	Standard Specifications and Code of Practice for Road Bridges, Section IX – Bearings, Part II: Elastomeric Bearings
11.	IRC: 83-2002 (Part III)	Standard Specifications and Code of Practice for Road Bridges, Section IX – Bearings, Part III: POT, POT-CUM-PTFE, PIN AND METALLIC GUIDE BEARINGS
12.	IRC: 87-1984	Guidelines for the Design and Erection of False work for Road Bridges
13.	IRC: 89-1997	Guidelines for Design and Construction of River Training & Control Works for Road Bridges (First Revision)
14.	IRC SP 20	Specifications for Rural Roads
15.	IRC: SP: 33-1989	Guidelines on Supplemental Measures for Design, Detailing & Durability of Important Bridge Structures
16.	IS 456-2000	Plain and Reinforced Concrete - Code of Practice

Latest revision of above codes shall be followed.

The competent authority shall approve the design of Bridges and culverts. For any structure for which detailed investigations are required the same may be conducted by the Assistant Engineer and supervised by the Assistant Executive Engineer, and details shall be furnished for final design and got approved by the competent authority. If the designs are decided to be done by Design wing of the concerned Chief Engineer may forward the details to Chief Engineer (A&D).

If the officer competent to approve a design requires the assistance of the Design wing for specific problem, he shall hold consultation with the Chief Engineer (A&D).

1512.2. Design Data Required for Design of Bridges

For all bridges to be designed in **the Chief Engineer (A&D) shall** make a complete investigation of the site and the design data and required drawings shall be prepared and submitted along with the proforma given in Appendix 1500A.

The other documents required to be submitted along with the investigation report are alignment plan approved by the Chief Engineer (A&D) and checklist given in Appendix 1500B & 1500C

1513. Design Procedure for Bridges

1513.1. Preliminary Design: The Assistant Director shall study the investigation details and alignment plan of a particular bridge and shall make note on any modification required for the above alignment plan considering the various design aspects. The Assistant Director shall also make preliminary design of the bridge in the form of a proposal drawing and submitted to the superior officers, if the modifications required in the alignment plan are of trivial nature. If any major alterations are required in the alignment plan, the same may be intimated to the Chief Engineer (A&D) with specific recommendations for revision

and approval. After receipt of the revised approved alignment, a proposal drawing shall be prepared on the basis of the same and forwarded the Chief Engineer (A&D) who shall subsequently furnish a feasibility report considering the various construction and economic aspects of the proposed bridge at the site.

1513.2. Detailed Design: Based on the feasibility report furnished and the alignment plan approved by the Chief Engineer (A&D), the Assistant Director shall do a general and detailed design of the bridge. The design shall be done by manually or by using approved computer software. In both cases a design volume shall be maintained and approved by the Chief Engineer (A&D). The Deputy Director shall check the general arrangement and detailed design drawing designed by the Assistant Director. The Joint Director shall review the same and the Director (Designs) shall recommend the drawings to Chief Engineer (A&D) for approval. The Chief Engineer (A&D) may entrust the whole design to outside consultant also if found necessary.

1514. Geometrical Criteria

1514.1. Width of Carriageway, Footpath, Median and Kerb; This shall be as per the provisions of IRC 5.

1514.2. Longitudinal Gradient: The Engineer in charge of design has to consider all aspects such as construction costs, practical problems in construction at the site and the vehicle operation cost, before finalizing the gradients. Based on the topography of site, IRC has recommended the following categories of gradients for roads which shall be applicable to bridges also.

Terrain	Ruling gradient	Limiting gradient	Exceptional gradient
a) Plain or rolling	3.3 % (1 in 30)	5 % (1 in 20)	6.7 % (1 in 15)
b) Mountainous terrain	5 % (1 in 20)	6 % (1 in 16.7)	7 % (1 in 14.5%)
c) Steep terrain	6 % (1 in 16.7)	7 % (1 in 14.5%)	8 % (1 in 12.5%)

Where non-motorised vehicle are likely to use the structure more appropriate lower gradients shall be utilized, but may need to a balance against cost and other environmental issues.

1514.3. Cross gradient

The deck cross gradient shall be adopted with a view that in localities with lower rainfall, a flatter camber and in places with high rainfall, a steeper camber. The values of cross gradient recommended by IRC for different types of road surfaces are as follows, which shall be applicable to bridges also.

Type of surface coat	Range of cross gradient in areas of rainfall
	Heavy to Light
a) Cement concrete	2.0% (1 in 50) to 1.7%(1 in 60)
b) Bituminous	2.5% (1 in 40) to 2.0%(1 in 50)

1514.4. Gradients, Super Elevation

If there is a change of gradient on the bridge deck, suitable vertical curve shall be introduced conforming to the stipulations contained in IRC: SP-23. The super elevation on the deck of a bridge on a horizontal curve shall be provided in accordance with the relevant IRC Road Standards.

1514.5. Clearances

The minimum vertical and horizontal clearance (clear height and width respectively available for passage of traffic) to be provided on bridges shall be as specified in IRC:5. For vertical and horizontal clearances at under passes and / rail over bridges the essential provisions of the code has to be followed.

1516. Hydraulic Criteria

1516.1. Design Discharge: The design discharge, for which the waterway of the bridge is to be designed, shall be based on maximum flood discharge of 50 years return cycle. In case where the requisite information is not available, the design discharge shall be the maximum estimated discharge determined by the methods suggested in IRC:5 or any other rational method. The investigation report shall contain the discharges obtained by the different methods suggested in IRC: 6.

1516.2. Effective Linear waterway, Afflux and Scour depth

The effective linear waterway may be compared with that provided under other bridges in the vicinity over the same river after duly considering their performance. IRC 5 may also be referred.

For calculation of afflux IRC SP: 13 may be referred to. To calculate the maximum scour depth, IRC: 5 and IRC SP: 13 shall be followed.

1516.3. Loading Criteria

The Loading criteria to be adopted for all the bridges are as per IRC: 6.

1517. Selection of Type of Bridge and Span Arrangement

1517.1.General Considerations: Specific site characteristics like width of crossing, nature of stream, depth of flow, depth of flow during different seasons, subsoil characteristics, and the capabilities of contracting agencies, who would be interested in building the structure including the availability of skilled and unskilled labour are mostly the major considerations in selecting the type of structure and span arrangements in specialized structures like long span bridges. The attempt of the engineers shall be towards minimising the overall cost of the total structure including approaches within the site-specific constraints as obtained. For normal simply supported structures, it has been observed that the total cost of the bridge proper tends to be the minimum, when the cost of superstructure approaches to that of foundation and substructure put together which may be applied as a thumb rule for initial trial.

1517.2.Environmental Considerations

Aesthetic and environmental considerations are increasingly becoming major factors in the selection of the type of structure including its foundation to be adopted for a specific site. To achieve aesthetically pleasing view of bridge structure, attention shall be paid to produce a clean, simple, well proportioned structured form. In most cases, achieving the desired structural quality may add little to the overall cost of structure. Aesthetic considerations include harmony with the general topography of the site, optimisation in the use of materials etc. Environmental considerations include limitation of noise levels during and after construction of the bridge and the level of pollution due to air and water during construction and service, conservation of flora and fauna etc.

1517.3. Economical Range of Span Lengths for Different Type of Superstructures

Piers and abutments shall be so located as to make the best use of the foundation conditions available. The number of supports and their locations shall be so fixed as to provide the most economical design of the bridge and at the same time to satisfy special requirements, if any, for navigation, railways or other crossings in consultation with the concerned authorities, floating logs or debris and bridge aesthetics, etc. Placing a pier at the deepest portion of an active channel may be avoided by suitably adjusting the number and length of the spans. The ranges of span length within which a particular type of superstructure can be economical along with other considerations like type of foundation etc. are given below:

Type of superstructure	Span (metres)
i) RCC single or multiple boxes	1.5 to 15
ii) Simply supported RCC slabs	3 to 10
iii) Simply supported RCC T beam	10 to 25
iv) Simply supported PSC girder	25 to 45
v) Simply supported RCC voided slab	10 to 15
vi) Simply supported / continuous PSC voided slab	15 to 30
vii) Continuous RCC voided slab	10 to 20
viii) RCC box sections; simply supported /Balanced cantilever continuous	25 to 50
ix) PSC box sections; simply supported /Balanced cantilever continuous	35 to 75
x) PSC cantilever construction / continuous	75 to 150
xi) Cable stayed bridges	100 to 800
xii) Suspension bridges	300 to 1500

However, whenever an economical span arrangement and type of structure is decided, it has to be ensured that the required infrastructure facilities, design and construction capabilities, specified materials etc. are available.

1518. Superstructure

It is the superstructure of a bridge that directly supports the traffic and facilitates its smooth uninterrupted passage over natural/man made barriers like rivers, creeks, railways, roads, etc. by transmitting the loads and forces coming over it to the foundation through the bearings and substructure. The minimum functional requirement of superstructure is mentioned in section 1617.2. Consistent with economy and local availability of the materials, labour and technology for a particular type of superstructure selection may have to be made out of the following:

- i) Reinforced cement concrete superstructure: These are the most popular type of superstructure in the present day which may take the form of solid slab, voided slab, T-beam and slab, box girder, rigid frame, arch, balanced cantilever or bow-string girder.
- ii) Pre-stressed concrete superstructure: This may also take any of the above forms referred in the previous paragraph. Care shall be taken about the provision of future pre-stressing to the extent of 20 per cent of total pre-stress force. For this purpose, dummy cables may be laid in the structure, which can be used for further pre-stressing if the need arises afterwards.
- iii) Steel superstructure: With increasing availability of quality steel at international prices in recent years the use of steel for superstructure is becoming attractive option. The forms, these may take are steel beam, plate girder, box girder, steel truss, arch, cantilever suspension bridges and cable stayed bridges.

Any combination of above materials considering their distinct advantages for particular elements may be adopted. Most common types of composite construction are cast in situ or pre-cast girder in pre-stressed concrete with RCC deck or steel beam/plate girders with RCC deck or cable stayed bridges with RCC or PSC deck.

1518.1. Design

Relevant IRC Codes which have to be complied in the design of superstructure are IRC: 40, IRC: 21, IRC: 18, IRC: 24, IRC: 22 for Masonry, RCC, PSC, Steel and Composite Structures respectively. Other codes applicable for all types of superstructures are IRC: 5 and IRC: 6. Other major guidelines also include IRC: 85. In case of IRC codes silent about some design aspects, provisions in the IS/International Codes may be followed.

1518.2. Standard Plans (Type designs)

Wherever possible the adoption of standard plans prepared by the MoRTH shall be followed for superstructure. These will obviate detailed individual designs for bridge decks and ensure that drawings are available on time and also maintain accuracy in design.

Ministry of Road Transport & Highways have brought out various standard plans which include standard plan for:

No.	Type of Deck	Skew Angle	Overall width of deck (m)	Effective span (m)
1.a.	RCC Solid Slab without footpath	0°	8.45	3.37, 4.37, 5.37, 6.37, 7.37, 8.37, 9.37, 10.37
1.b.	RCC Solid Slab with footpath	0°	11.05	3.37, 4.37, 5.37, 6.37, 7.37, 8.37, 9.37, 10.37
1.c.	RCC Solid Slab without footpath	15°, 30° 45°, 60°	8.45	5.37, 6.37, 8.37
1.d.	RCC Solid Slab with footpath	15°, 30° 45°, 60°	11.05	4.37, 6.37 & 8.37
1.e.	RCC Solid Slab with and without footpath	0°	12.00	3.00, 4.00, 5.00, 6.00, 7.00, 8.00, 9.00, 10.00
1.f.	RCC Solid Slab without footpath	15°,	12.00	4.00, 6.00, 8.00, 10.00

		22.5°, 35°		
2.a.	RCC T-beam and slab without footpath (3 girders)	0°	8.45	10.5, 12.5, 14.5, 16.5, 18.75, 21.75, 24.75
2.b.	RCC T-beam and slab with footpath (3 girders)	0°	11.05	10.5, 12.5, 14.5, 16.5, 18.75, 21.75, 24.75
2.c.	RCC T-beam and slab with & without footpath (4 girders)	0°	12.00	10.0, 12.0, 14.0, 16.0, 18.0, 21.0, 24.0
3.a.	PSC Girder and RC Slab without footpath (3 girders)	0°	8.58	30.0 & 40.0
3.b.	PSC Girder and RC Slab with footpath (3 girders)	0°	11.23	30.0 & 35.0

1519. Bearings

The design of metallic bearings and neoprene bearings shall be in conformity with IRC: 83 Parts II & I. and clause 2000 of Specifications for Road and Bridge Works published by Ministry of Road Transport and Highways (MoRTH)

(MoRTH) carries out pre-qualification of the manufacturers of bearings from time to time. The pre-qualification is valid for a certain period. Bearings have to be procured from such manufacturers only.

1520. Sub-structure

Substructure include those portions of a bridge which are above the foundation which include piers, abutments, abutment and pier caps, dirt wall, returns, wing wall etc. but excludes bearings and superstructure. It can be built of brick/stone masonry, plain/reinforced/pre-stressed concrete, steel. Selection of a particular type of sub structure depends upon the span and type of superstructure, the height of substructure, availability of construction material and construction equipments, period and time of construction and above all on overall economy. The shape of piers and abutments in general, shall be such as to cause minimum obstruction to flow of water.

1520.1.General Considerations:

The following general conditions are to be followed for the construction of substructures:

- i) On all exposed faces of concrete member a minimum reinforcement equivalent to 2.5 kg/sq.m. shall be provided to withstand stresses due to temperature and shrinkage with maximum spacing limited to 200 mm.
- ii) The width of abutment and pier cap shall be fixed on the basis of design and construction requirement. Further it shall be sufficient to accommodate not only the bearings but also an offset of 150 mm beyond the edges of the bearings and also facilitate inspection and repairs of bearings. The thickness of such caps shall not be less than 225mm up to a span of 25 m.
- iii) In skew bridges, where bearings are placed at right angles to the longitudinal axis of the bridge, the top width of the piers/abutment has to be more compared to right bridges in order to have a clear distance of 150 mm beyond the edges of bearings.
- iv) It is desirable to lay the abutment caps and the dirt walls over abutments with the same concrete and in one operation, and make them monolithic by detailing the reinforcement properly, to avoid cracking at the junction of the two components.
- v) The top of wing return walls shall be carried 100 mm above the top of the slope of embankment to prevent any soil from being blown or washed away by rain.
- vi) Length of cantilever returns where adopted, shall not be more than 3.5 metres.
- vii) All abutments shall be designed for a live load surcharge equivalent to 1.2 m height of earth fill.
- viii) All wing walls or return walls provided for full height of approaches shall be designed to withstand a live load surcharge equivalent to 0.6 m height of earth fill.
- ix) The fill behind abutments, wing walls, and return walls shall conform to specifications given in IRC:78.
- x) Suitably designed cut and ease waters shall be provided in piers up to affluxes High Flood Level or higher from consideration of waves, etc.
- xi) If the height of pier exceeds 6 metres, R.C.C. piers may be preferred.

1520.2. Design: Sub-structure shall be designed to withstand the loads and forces as specified in IRC:6, the worst combination of forces and factors of safety shall be as specified in IRC:78. For allowable

stresses and other design requirements, IRC Codes depending upon the type of construction material shall be followed.

1521. Bridge Foundations

The foundations for piers and abutments shall be at such depths that they are safe against scour and large impacts where necessary and are protected against it. They shall be taken down to a level sufficient to secure firm foundation from consideration of bearing capacity, overall stability and suitability of the strata at founding level and sufficient depth below it. The subsoil characteristics obtained at a particular site and consequently the type of foundations feasible is one of the major considerations in selection of type of structure and span arrangement.

It is necessary to evaluate, in advance, at the preliminary design stage, the pros and cons of choice of a particular type of foundation. The selection of wrong type of foundation may lead to delay in construction, increase in cost, and distress during construction and sometimes impossibilities of realizing technical requirement. In order to avoid such difficulties that may arise during execution stage, alternative foundation types shall be suggested in the Proposal Drawing. The concerned authority in the field office shall study the pros and cons of constructing the suggested types of foundations and shall record a note about the same in the feasibility report. Based on the above report, the type of foundation shall be fixed by the engineer responsible for the design. **Refer IRC 78 for different types of foundations.**

1522. General Considerations and Design

All Bridges within 20 km of the sea coast shall be given anti corrosive treatment for reinforcements as per specifications for Road and Bridge Works published by (MoRTH) and IS 13260. Epoxy painting may be given to all exposed surface of RCC structural elements in the seacoast area; similar treatment may also be done in areas prone to industrial/environmental pollution.

1522.1. Open foundations: The design aspects of open foundations can be obtained from IRC: 21 and IRC: 78. Excavation on open foundations shall be done after taking necessary safety precautions for which guidance may be taken from IS: 3764.

1522.2. Well foundations: Well foundation shall be designed to withstand the loads and forces as specified in IRC: 6, the stability and design of well foundations shall be done under the most critical combination of loads and forces as specified in IRC: 78. The pressure on foundations shall also satisfy the provisions of IRC: 78. For allowable stresses and other design requirements, IRC: 21 shall be followed.

1522.3. Pile foundations: Piles shall be designed to carry uplift and lateral loads besides direct vertical load. The worst combination of forces and factors of safety shall be as specified in IRC: 78. For design of piles guidance may be taken from IS: 2911 subject to limitations/stipulations given in IRC: 78. For allowable stresses and other design requirements, IRC: 21 shall be followed.

1522.4. Expansion Joints

Expansion joints are provided at the end of deck and cater for movement of deck due to temperature, shrinkage, creep etc. Expansion joints make the deck joint leak proof, protect the edges of slab/girder and allow smooth passage of loads from one span to other by bridging the gap. Depending upon the gap width to be bridged, there are various types of expansion joints in use at present. IRC 83-part Part II and I may be referred for details regarding expansion joints.

Specifications for Road and Bridge Works published by (MoRTH) have issued interim specifications for expansion joints and subsequent modifications in the list of manufacturers/suppliers, which may be followed. Further, a warranty of 10 years of trouble free performance may be insisted upon from the contractors/suppliers for all type of joints except for buried joints and filler joints.

1522.5. Railings, Parapets or Guide Posts and Crash Barriers

The forces to be considered in design of Railings, Parapets or Guide Posts and Crash Barriers shall be as per relevant stipulations of IRC:6. For R.O.Bs across railway lines, those for railway's safety shall govern these requirements.

1522.6. Surface Finishes and Drainage of Carriageway

All carriageway and footpath surfaces shall have anti-skid characteristics. Average 75 mm thick M20 cement concrete with temperature steel shall be provided for wearing coat with necessary camber and over it a uniform treatment of 25mm mastic asphalt top layer for waterproofing. Alternately wearing coat as specified in Specifications for Road and Bridge Works published by (MoRTH) may be provided depending on site condition.

The deck has camber or super elevation, which guides rainwater towards kerbs, and waterspouts located near the kerb further disposes the water out. One waterspout per 20 sq.m. of the deck area is considered adequate and the spacing shall not exceed 10 m. The spout shall have diameter not less than 100 mm and shall be of corrosion resistant material such as galvanised steel, with suitable clean out fixture. The arrangement of waterspout shall be detailed along with the Detailed Design Drawing of the Superstructure.

For drainage of a road over bridge or flyover, a suitably designed drainage arrangement shall be provided. This may consist of vertical C.I. or rigid PVC pipes connecting the down spouts below the deck with funnels and along the pier up to ground level and eventually joined to the road drainage system. Suitable vertical recess in the piers may be provided to accommodate the drainage pipes rather than providing drip courses underneath the deck slab.

If the height of abutment and return wall above bed level is more than 2 metres, weep holes shall be provided 150 mm above low water level or ground level whichever is higher at centre of 2 metres horizontally and 1 metre vertically (Slope of 1 in 20) and shall be staggered. Normally 100 mm diameter PVC pipe shall be used. Provision made in IRC: 40 may also be referred.

1522.7. Utilities

In all bridges with footpaths, a service duct shall be made under one or both footpaths to take water supply mains, electric and telephone cables etc. The size and other requirement may be as per standards in practice. Where footpaths are not provided, provision shall be made for supporting a suspended service duct under the cross girder. For this purpose suitable boot holes may be left in the cross girders, which can later be used for fixing steel supports for a suspended deck with due care for durability and serviceability of the bridge and its approaches. For details refer IRC 98

1522.8. Access for Inspection and Maintenance

The design of the bridge shall be such as to provide for adequate access to all parts of the bridge to facilitate future inspection and maintenance operations.

1522.9. Illumination of Bridge Deck

Provision for Illumination for bridges, grade separators and interchanges shall be an integral part of the estimate. This shall be done in consultation with the Electrical wing. The installation, lighting arrangement, and method of control, switches etc. shall all conform to the provision contained in IS: 1944. Illumination levels for the vehicular and pedestrian subway/underpasses may be kept same as those on the approaches at either end of the subway/underpass.

1522.10. Approaches to Bridges

The approaches on either side of a straight bridge shall have a minimum straight length of 15 meters in the case of State Highways and MDRs and 10 meters in the case of ODRs and shall be suitably increased to where necessary to provide for the minimum sight distance for the design speed. In difficult situations, the Engineer responsible for the design may at his discretion permit a reduction in the minimum straight length of approaches, provided reasons for making a departure from the Code are clearly recorded in the proforma for Design Data submitted along with the Investigation Report. The investigation reports shall be accompanied by land plan clearly marking the land to be acquired from private and public bodies and the extend of each category along with the duly completed social impact check list.

Where horizontal curves have to be provided on the approaches beyond the straight portion on either side, the minimum radius of curvature, the super elevation and transition length for various speed and the curve radii shall be provided in accordance with relevant stipulations contained in IRC: 38.

If there is a change of gradient, suitable vertical curves shall be introduced conforming to relevant stipulations contained in IRC: 23.

Minimum surfaced width of these straight lengths of approaches shall be equal to the carriageway width on the bridge.

Reinforced concrete approach slab covering the entire width of roadway shall be provided as per the details given in the Detailed Design Drawing of the particular bridge. The minimum length of approach slab shall be 3.5 meters and the minimum thickness as 150 mm.

If the approaches is in filling, borrow pits shall not be dug close to the embankment to avoid risk of parallel flow being developed which may endanger safety of the embankment. In this connection,

provision made in IRC: 10 may also be kept in view.

Where the ground level falls continuously away from the banks of the stream, the overflow spreads far and away from banks. In such cases, it is impossible to force the overflow back into the main stream. The correct thing to do is to pass the overflow through relief culverts at suitable points in the road embankment. They shall not be too small to cause detrimental ponding up of the overflow, resulting in damage to the road or some property. Nor, shall they be so big as to attract the main current. Also protection work has to be designed at downstream of the culverts so as to dissipate the energy of the falling water, where the water from the relief culvert, rejoins the main stream somewhere lower down.

1522.11. River Training and Protection Work

River training and protective works are required for ensuring the safety of bridges and their approaches on either side. The selection of the type of river training or protective work will depend upon terrain, overall behaviour of the river, location of the bridge vis-à-vis the areas of attack of the river, span arrangement, nearness of the approaches from the influence zone of the river, etc. The types of river training and protective works generally being used are as follows:

- i) Guide bunds
- ii) Spurs or groynes
- iii) River bank protection
- iv) Approach road protection
- v) River bed protection

The details of river training measures shall be referred to in Section 2500 of Specifications for Road and Bridge works published by (MoRTH)

1523. Road Signs and Signals

All multi-lane bridges, complex interchanges and grade-separated structures shall be provided with overhead signs and signals conforming to the provision contained in IRC: 67. Non-luminous signs, however, shall not be permitted. IRC SP 31 may be referred for new sign and IRC: 5 for overhead structures.

1524. Building Design

This section deals with the general building requirements to ensure safety of public health through open spaces, adequate room sizes and limitations on area and height of building.

1524.1. Introduction

Based on the preliminary investigation report, the architectural wing prepares a layout plan of the structure in consultation with client and the Electric Wing, which shall be got approved by the concerned department. The architect wing shall then prepare detailed architectural plan. This shall comply with The National Building Code 2005 and the Kerala Municipal Building Rules.

R.C.C. design of all load bearing structures and framed structures up to two stories shall be prepared by the Assistant Engineers and approved by the Executive **Engineers and** Superintending engineers as per their powers. Necessary wind and seismic analysis must be performed. If the design is complicated the engineer can refer it to **the Chief Engineer (A&D)** for detailed design.

Design Wing **of the Chief Engineer (A&D) office** will undertake the work of preparing R.C.C, design for a structure only after the receipt of the following information.

- ✓ Set of original Architectural drawings and CD from Chief Engineer (A&D) or through WINGS web portal.
- ✓ Copy of Administrative approval to the estimate of the structure, (based on approved Architectural drawings.)
- ✓ Soil investigation details.
- ✓ Proposed construction programme i.e. proposed dates of start of different stages of construction and scope of different phases of construction in case of phased construction from the Executive Engineers office.

After the Executive Engineer submits the required documents and architects design on a CD or through WINGS Portal to the Design Wing (Signed copies also to be forwarded), the Final design shall be prepared and forwarded to the EE/SE/ CE as per TS issuing powers **by the Executive Engineer /Chief Engineer (A&D)**. The Architects plan shall also be forwarded to Electrical wing simultaneously, for

preparing layout of electric installations and concerned Executive Engineer for preparing sanitary and water supply details.

1524.2.Design Philosophy

R.C.C design of buildings is being carried out mainly by three methods of design. They are namely: (1) Working stress method, (2) Ultimate load method and (3) Limit state method.

The Limit state method is now in vogue in all government design offices and premier private consulting firms .The B.I.S. have published I.S.: 456-2000 incorporating the use of Limit state Method of design.

Working Stress Method: Used over decades, this method is now practically outdated in many advanced countries of the world, because of its inherent limitations

The I.S: 456-2000 code gives emphasis on Limit State Method which is the modified form of Ultimate Load Method .

Besides analytical part of structural design, following factors shall also be kept in mind while designing the structure.

- ✓ Strength of structure.
- ✓ Durability of structure.
- ✓ Serviceability of structure, during construction as well as during design life time of structure.
- ✓ Economy in building materials and ease of constructions.
- ✓ Economy in entering and formwork.
- ✓ Aesthetics and functional use of structure.

1524.3. Classification of buildings

Buildings are classified based on occupancy and type of construction as per the provisions of National Building Code 2005 part III Clause 7.

List of I.S. Codes generally required to be referred for Building Design

The National Building Code published by the Bureau of Indian Standards and Kerala Municipal Building Rules has to be followed for the purpose of design of Buildings. The important I.S. Codes (with their latest editions/ amendments) to be referred to for design of building are as follows:

- | | | |
|-----|-----------------|---|
| 1. | I.S. 456-2000 | Code of practice for plain and reinforced concrete. |
| 2. | I.S. 800-1962 | Code of practice for use of structural steel in general building construction. |
| 3. | I.S. 875-1987 | Designs load other than (part I to V) earthquake for building Design. |
| 4. | | Part-I: Dead loads. |
| 5. | | Part-II: Imposed loads. |
| 6. | | Part-III: Wind loads. |
| 7. | | Part IV: Snow loads. |
| 8. | | Part V: Special loads and load combinations. |
| 9. | I.S. 1080-1965 | Code of practice for design and construction of shallow foundation in soils (other than Raft, Ring and shell) |
| 10. | I.S: 1642-1988 | Fire safety of buildings (General) Detail 3 of construction. |
| 11. | I.S.: 1643-1988 | Code of practice for Fire safety of buildings (General) Exposure Hazard. |
| 12. | I.S. 1644-1988 | Code of practice for Fire safety of buildings (General) Exit requirements and personal Hazards. |
| 13. | I.S. 1888-1972 | Methods of load test on soils. |
| 14. | I.S.: 1893-1984 | Criteria for earthquake resistant design of structures. |
| 15. | I.S: 1904-1986 | Code of practice for design & construction of pile foundation in soil structural safety of building foundation. |
| 16. | I.S. 2911-1990 | Code of practice for design and construction of pile (Part I to IV) foundation. |
| 17. | I.S. 2950-1981 | Code of practice for design and construction of raft foundation. |
| 18. | I.S. 3370-1965 | Code of Practice for water retaining structures. |
| 19. | I.S. 3414-1987 | Code of Practice for Design and Installation of joints in buildings. |
| 20. | I.S. 4326-1993 | Code of practice for earthquake resistant design of structure. |
| 21. | I.S. 6403-1981 | Code of practice for Determination of bearing pressure of shallow foundation . |

22. I.S.13920-1993 Code of practice for ductility detailing of reinforced concrete structures subjected to seismic forces .

Latest revisions of above code shall be followed.

I.S. Codes are also available for design of special types of structures like folded plate, shell structures etc. Refer publication list of BIS for the same.

Similarly there are special publications of I.S., which are useful for design of buildings such as.

1. SP-16 Design Aids to I.S.: 456-1978
2. SP-22 Explanation to I.S.: 1893 & I.S.: 4326.
3. SP-23 Concrete Mix.
4. SP-24 Explanation of I.S. 456-1978.
5. SP-25 Cracks in buildings and their repairs.
6. SP- 34 Detailing in R.C.C. structures.
7. SP-38 Design of steel trusses.

For aspects, which are not covered by any other I.S. codes available, relevant International Standard Codes may be referred to. While designing R.C.C. structures, important provisions (as detailed below) of I.S. 456 must be borne in mind.

General Provisions

Clause No. 20 Deals with stability of the structure against overturning and sliding.

Clause No. 26.2.1: Development length of bars.

Clause No. 26.3.2: Minimum distance between individual bars.

Clause No.26.3.3: Maximum distance between bars in tension.

Clause No.26.4: Cover to reinforcement.

Clause No.27: Expansion joints.

Provision regarding slabs

Clause No.22.2: Effective span.

Clause No.22.4.1: Arrangement of live load.

Clause No.22.5: Moment and shear co-efficient for continuous beams .

Clause No.23.2: Control of deflection.

Clause No.24.1: Provisions regarding solid slabs.

Clause No. 26.5.2.1: Minimum reinforcement.

Clause No.26.5.2.2: Maximum diameter.

Provisions regarding beams

Clause No.22.2: Effective span

Clause No.22.4.1: Arrangement of live load.

Clause No. 22.5: Moment and shear co-efficient for continuous beams.

Clause No. 23.2: Control of deflection.

Clause No. 23.3: Slenderness limits for beams.

Clause No. 26.5.1.1: Tension Reinforcement.

Clause No. 26.5.1.2: Compression reinforcement.

Clause No. 26.5.1.3: Side face reinforcement.

Clause No.26.5.1.5: Maximum spacing of shear reinforcement.

Clause No.26.5.1.6: Minimum shear reinforcement.

Clause No.26.5.1.7: Distribution of torsion reinforcement.

Provisions for columns;

Clause No.25.1.2: Short and slender compression members.

Clause No.25.1.3: Unsupported length.

Clause No.25.2: Effective length of compression members.

Clause No.25.3: Slenderness limits for columns.

Clause No.25.4: Minimum eccentricity.

Clause No.26.5.3.1: Longitudinal reinforcement.

Clause No. 26.5.3.2: Transverse reinforcement.

Clause No.43: Cracking Consideration.

Provisions for footings

Clause No. 33.1.2: Thickness at the edge of footing.

Clause No.34.4: Transfer of load at the base of column.

Appendix- 1500 A

7.14 DESIGN DATA FOR MAJOR AND MINOR BRIDGES

7.14.1 General

1. Name of Road :
2. Classification of Road : SH / MDR / ODR
3. Road chainage at centre :
4. Land width of road :
5. Formation width of road :
6. Width of Roadway :
7. Name of the Stream/Canal/Backwater :
8. What arrangement exists for crossing the river at present
 - a. during monsoon :
 - b. during dry season :
9. Type of Navigation
 - a. (if any, whether country boat / INS / NWW) :
10. Distance of site from the sea :

7.14.2 Catchment area and run-off (applicable for rivers only)

11. Catchment area
 - in hilly parts :
 - in plains :
12. Rainfall during the year and maximum recorded intensity :
13. Nature of catchment :
14. Any artificial or natural storage present in the catchment :

C. Nature of Stream/Canal:

15. Is the stream
 - a) alluvial with erodable banks :
 - b) quasi-alluvial with fixed bed but erodable banks :
 - c) rigid with inerodable bed and banks :
16. Is the stream
 - a) perennial : Yes/No
 - b) seasonal : Yes/No
 - c) tidal : Yes/No
 - if so i) High Tide Level (HTL) :
 - ii)Low Tide Level (LTL) :
 - d) saline : Yes/No
 - e) polluted with any industrial waste : Yes/No
 - if so, specify the predominant chemicals in the waste:
17. Hydraulic particulars at low water level
 - a) Low Water Level (LWL) :
 - b) observed water surface velocity :
 - c) water surface slope :
 - d) bed slope :
18. Hydraulic particulars at high flood level
 - a) High Flood Level (HFL)
 - i) at site :
 - ii) at u/s cross section :
 - iii) at d/s cross section :
(specify distance of u/s & d/s from site)
 - b) estimated water surface velocity :
 - c) water surface slope :
 - e) area of cross section
 - i) at site :

- ii) at u/s cross section
- iii) at d/s cross section :
- f) discharge at H.F.L. :
- 19. R.L. and location of maximum scour recorded below HFL:
- 20. R.L. of maximum anticipated scour below HFL (scour depth shall be determined actually by mechanical means)
- 21. Nature of bed material: fine sand / loose clay /Coarse sand /
fine gravel / Sandy or stiff clay /
Coarse gravel / Boulders /Rock

7.14.2.1 D. Ventway Parameters:

- 22. Vertical clearance above HFL required for navigation:
- 23. Horizontal clearance required for navigation:
- 24. Does the stream carry drifting matter in floods? :
- 25. Details of training works, if needed:

E. Alignment and approaches:

- 26. Whether the bridge proposed is right or skew? :
if skew, give the angle of skew :
- 27. Whether the approaches straight? :
if not i) straight reach and radius of curve at side-1 :
ii) straight reach and radius of curve at side-2 :
- 28. Maximum approach height possible at site:
- 29. Proposed gradient on approaches:
- 30. Do the approaches require land acquisition/in voluntary displacement:

F. Superstructure:

- 31. Loading to be done for (Class A / 70R):
- 31. Proposed clear roadway over the bridge:
- 32. Width of footpath, if any:
- 33. Formation level i) at centre of bridge:
ii) at abutment points:
- 34. Number and size of span recommended:

G. Foundations:

- 35. Foundations recommended: Open / Well / Pile

7.14.2.2 H. Existing Structures

- 36. Details of each of the existing bridges on the stream/canal in the vicinity

No.	Details	Upstream	Downstream
a)	Distance from site		
b)	Number and size of spans		
c)	Year of construction		
d)	Type of structure		
e)	Width of roadway		
f)	Provision of footpath		
g)	Vertical clearance		
h)	Horizontal clearance		
i)	Type & depth of foundations		
j)	Whether the existing structure is trouble free		
k)	Any other information		

7.14.2.3 I. Miscellaneous

- 37. Name of town nearest to the bridge:
- 38. Nearest Railway station and its distance from bridge site:
- 39. Is the site located in an industrially or otherwise polluted area:
(If so, specify the predominant air and water pollutant):

40. Nature of terrain: Plain/Rolling/Hilly

	Prepared by	Verified by	Reviewed by	Recommended by
Signature				
Designation	Assistant Engineer	Asst. Executive Engineer	Executive Engineer	Superintending Engineer(R & B)

Appendix 1500B

CHECK LIST OF DETAILS REQUIRED FOR APPROVAL OF ALIGNMENT

Road/ Bridge

Name of Work:

- | | |
|--|----------------|
| 1. S.E.'s Authentication in all drawings and data: | Yes/No |
| 2. Investigation report: | Yes/No |
| 3. Form D.A. Completely filled up: | Yes/No |
| 4. Design Data form completely filled up: | Yes/No |
| 5. Index map (District map): | Yes/No |
| 6. Key map (site plan): | Yes/No |
| 7. Two copies of Alignment plan with the following details: | Yes/No |
| a) Names of stations connected: | Yes/No |
| b) North direction: | Yes/No |
| c) <i>Name of River:</i> | <i>Yes/No</i> |
| d) <i>Direction of flow:</i> | <i>Yes/No</i> |
| e) <i>Skew angle (if any):</i> | <i>Yes/No</i> |
| f) <i>Width of river at HFL:</i> | <i>Yes/No</i> |
| g) Proposed Land width (available/to be acquired): | Yes/No |
| h) Continuous chainages of approach roads: | Yes/No |
| i) Bore hole locations with chainages: | Yes/No |
| j) Strip plan for affected properties: | Yes/No |
| k) Social impact assessment (SIA) reports. If the impact fall within category A or B | Yes/No |
| 8. L.S. PLOT of the road along the alignment: | Yes/No |
| a) Reduced levels: | Yes/No |
| b) Proposed formation levels: | Yes/No |
| c) <i>LWL, OFL, HFL and LTL & HTL(if any)</i> | <i>:Yes/No</i> |
| d) Bore hole details with reduced levels: | Yes/No |
| 9. List of horizontal curves with chainages: | Yes/No |
| 10. List of gradient with chainages: | Yes/No |

Note: 1 If any of the above items is marked as 'No', the reasons for the same shall be indicated along with this.

2 Italicised details not required for roads.

Appendix 1500C

CHECK LIST OF DETAILS REQUIRED FOR DESIGN OF ROADS/ BRIDGE

Name of Work:

- | | |
|--|---------------|
| 1. S.E.'s Authentication in all drawings and data: | Yes/No |
| 2. Copy of Administrative Sanction obtained: | Yes/No |
| 3. Investigation report: | Yes/No |
| 4. Design Data form completely filled up: | Yes/No |
| 5. Index map (District map): | Yes/No |
| 6. Key map (site plan): | Yes/No |
| 7. <i>Catchment area map:</i> | <i>Yes/No</i> |

8.	Two copies of approved Alignment plan with the following details:	Yes/No
	a) Names of stations connected:	Yes/No
	b) North direction:	Yes/No
	c) <i>Name of River:</i>	<i>Yes/No</i>
	d) <i>Direction of flow:</i>	<i>Yes/No</i>
	e) <i>Skew angle (if any):</i>	<i>Yes/No</i>
	f) <i>Width of river at HFL:</i>	<i>Yes/No</i>
	g) Proposed Land width (available/to be acquired):	Yes/No
	h) Social impact data sheet	Yes/No
	i) table of impact by type	Yes/No
	j) Continuous chainages of approach roads:	Yes/No
	k) Bore hole locations with chainages:	Yes/No
9.	L.S. PLOT of the road along the alignment:	Yes/No
	a) Reduced levels:	Yes/No
	b) Proposed formation levels:	Yes/No
	c) <i>LWL, OFL, HFL and LTL & HTL (if any):</i>	<i>Yes/No</i>
	d) Bore hole details with reduced levels:	Yes/No
10.	<i>Cross sections of the river</i>	
	a) <i>At site:</i>	<i>Yes/No</i>
	b) <i>At upstream side:</i>	<i>Yes/No</i>
	c) <i>At downstream side:</i>	<i>Yes/No</i>
11.	List of horizontal curves with chainages:	Yes/No
12.	List of gradient with chainages:	Yes/No
13.	<i>Discharge calculation sheets:</i>	<i>Yes/No</i>
14.	<i>Vent way calculation sheets:</i>	<i>Yes/No</i>
15.	Design Details of pavement (BT/CC/WBM):	Yes/No
16.	Resettlement Action plan	Yes/No

-
- Note: 1 If any of the above items is marked as 'No', the reasons for the same shall be indicated along with this.
- 2 Italicised details not required for roads.

APPENDIX 1600 A1

Model Preliminary estimate for Road Works

Name of Project

Name of Division, subdivision, section. (Constituency also)

Part I. Acquisition of site.

- (a) Land acquisition.
- (h) Acquisition of structures and R& R cost.
- (c) Shifting of electrical lines, Telephone/Telegraph lines, Pipe lines etc.

Part II. General improvements.

- (a) Felling trees.
- (b) Earthwork-widening, raising and/or forming embankments.
- (c) Blasting rock.
- (d) Conveyance of materials.

Part III. Masonry works.

- (a) Retaining walls.
- (b) Construction of culverts.
- (c) Construction of small bridges.

Part IV. Surfacing

- (a) Gravelling or soling and/or metalling.

- (i) Supply of materials.
- (ii) Spreading & consolidation of materials to form the road.
- (iii) Forming the sides.
- (b) Remetalling.
 - (i) Supply of materials.
 - (ii) Spreading and consolidation of mate materials to form the road surface.
 - (iii) Forming the sides.
- Part V. Blacktopping.
 - (i) Supply of materials (a) metal (b) sand (c) bitumen.
 - (ii) Mixing, spreading and consolidating the materials.
 - (iii) Forming sides.
- Part VI. Miscellaneous and Protective Items.
 - (a) Turfing slopes of embankments.
 - (b) Cutting side drains and slope drains.
 - (c) Providing guard stones.
 - (d) Providing Km stones.
 - (c) Providing signboards.
- Part VII. Tools and plant.
- Part VIII. Value of departmental materials such as rubble credited, if any
- Part IX. (a)Contingency charges.
 - (b) Difference in value between recovery rate and issue rate of materials etc.
 - (c) Cost for project preparation including investigation and design.
- TOTAL COST OF WORKS**
- Part X. Time schedule for the completion of the work.

APPENDIX 1600 A2
Model Preliminary Estimate for Bridge Works

- Name of Project
- Name of Division, subdivision, section. (Constituency also)
- Part I. Acquisition of site,
 - (a) Land Acquisition.
 - (b) Acquisition of structures and R & R cost.
 - (c) Shifting of electrical lines, Telephone lines, Telegraph lines, Pipe lines etc.
 - (d) Felling trees.
- Part 11. Construction of temporary site office and working yard when necessary.
- Part III Foundation.
- Part IV. Sub-structure.
- Part V. Super-structure.
- Part VI. Approaches.
 - (a) Earth work filling/Cutting including conveyance if any.
 - (b) Blasting rock.
 - (c) Masonry works.
 - (i) Retaining walls.
 - (ii) culverts.
 - (d) Soling and/or metalling.
 - (i) Supply of materials.
 - (ii) Spreading & consolidating the materials for forming the road surface.
 - (e) Black top surfacing.
 - (i) Supply of materials (a) metal (b) sand (c) bitumen.
 - (ii) Mixing, spreading & consolidation for forming the surface of the road.
 - (iii) Forming the sides of roads.
- Part VII. Miscellaneous items.
 - (a) Providing guard stones & Km. stones.
 - (b) Name and sign boards.
 - (c) Turfing slopes of embankments.
 - (d) Cutting side drains and/or slope drains.

- Part VIII. Tools & Plant.
- Part IX. Value of departmental materials such as rubble credited, if any
- Part X. (a)Contingency charges.
 - (b) Difference in value between recovery rate and issue rate of materials etc.
 - (c) Cost for project preparation including investigation and design.
- TOTAL COST OF WORKS
- Part X. Time schedule for the completion of the work.

APPENDIX 1600 A3

III. Model Preliminary Estimate for Building Works

- Name of Project
- Name of Division, subdivision, section. (Constituency also)
- Part I. Acquisition of site-. .
 - (a) Land acquisition.
 - (b) Acquisition of structures, if any.
 - (c) Resettlement and Rehabilitation cost
 - (d) Shifting of Electrical lines/ telephone/Telegraph lines and Drainage Sewer Pipe lines.
- Part II. Preparation of site.
 - (a) Clearing and levelling site.
 - (b) Demolishing existing structures, felling trees etc., if any.
- Part III. Earth work.
 - (a) Earth work for foundation.
 - (b) Filling basement.
- Part IV. Sub-structure and super-structure.
 - (a) Foundation.
 - (b) Basement.
 - (c) Superstructure.
 - (d) Wood work for doors and windows etc.
 - (e) Roof timber/trusses.
 - (f) M. P. tiled/A. C. Sheet/RCC/Roof.
- Part V. Finishing items.
 - (a) Flooring.
 - (b) Ceiling.
 - (c) Plastering.
 - (d) Painting etc.
- Part VI. Service connection.
 - (a) Water supply both internal and external / well with pumping arrangement and overhead tank.
 - (b) Sanitary installation both internal and external.
 - (c) Electrical installation both internal and external.
 - (d) Provision for electronic installation both internal and external.
- Part VII.
 - (a) Compound wall/Enclosures.
 - (b) Approach roads.
- Part VIII. Tools and Plant.
- Part IX. Value of departmental materials such as rubble credited, if any
- Part X. Miscellaneous
 - a) Lift
 - b) Firefighting
 - c) HVAC
 - d) Storm water storage
- Part XI. Other items.
 - (a) Contingency.
 - (b) Difference in value between recovery rate and issue rate of materials etc.
 - (c) Cost for project preparation including investigation and design.

TOTAL COST OF WORKS

Part XI. Time schedule for the completion of work.

Appendix 1600 B
Docket Sheet
ISSUE OF TECHNICAL SANCTION

KeralaDepartment

Name of Division

Name of Sub Division

Name of Work

Amount of Estimate

Reference to Administrative Sanction

Register Number and date of estimate

Source of funds

Duration in which work has to be executed

Estimate enclosed as briefly described above is sanctioned as register number
.....dated.....

Signature of Engineer

Appendix 1600 B1
Preliminary Estimate Report

(Details to be incorporated in Preliminary Project Reports for Roads)

1. Name of Work and Scope
2. Authority and Plan Provision
3. Climatic, Geographic and Historic details
4. Necessity/Justification (with traffic counts): Reasons for justifying the work, based on traffic intensity, proximity and location in relation to important town and industrial and commercial centres, educational institutions, hospitals etc., which will be served by the road.
5. Existing facilities
 - i) Road way
 - ii) Transport
 - iii) Pavement and Shaller Condition
 - iv) Cross drainage facilities
6. Engineering facilities required for transport
 - i. Classification as per standards.
 - ii. Alignment with respect of topographical features, bridge sites, important town etc.
 - iii. Gradient
 - iv. Type of pavement and surfacing
 - v. Geometries with reference to the general standards for different classifications.
 - vi. Protective works required
 - vii. Drainage facilities and cross drainage works with location and type of each work
 - viii. Any other technical features as may be found necessary
7. Timeframe to complete proposed project
8. Plans including an index map, location map showing alternative proposals, LS and typical CS.
9. Rough cost estimate giving a break up of the cost under major heads, viz, land acquisition, R & R, EW, pavement, surfacing, protective works, cross drainage works as per Appendix 3.13 a.

Note: 1. Where realignment of telegraph posts, telephone lines, cables water mains etc. are involved, the site survey shall show their present location and the extent of realignment requirement required, so that the concerned departments may be addressed.

2. The standards prescribed in regard to road width and geometrics of the road shall be fully adhered to through out the length of the road. If for any reasons such adherence is found not possible, the sanction of the Chief Engineer shall be obtained for relaxing the standards.

Appendix 1600 B2

(Details to be incorporated in Preliminary Project Reports for Bridges)

1. Name of Work and Scope
2. Authority and Plan Provision
3. Climatic, Geographic and Historic details
4. Necessity/Justification (with traffic): Reasons for justifying the work, based on traffic intensity, details of the bridges crossing the river within a reasonable distance of the proposed bridge.
5. Existing facilities
6. Engineering features giving:
 - i. Class of road in which bridge is proposed and Technical standards for bridge.
 - ii. Flood characteristics and maximum flood discharge in the stream.
 - iii. Periods of high flood levels for a number of years.
 - iv. Soil and sub soil particulars at the site
 - v. Type of foundation
 - vi. Type of superstructure suggested.
 - vii. Angle and direction of skew if any.
 - viii. Number of spans
 - ix. Any other technical details as may be necessary
7. Plans viz, index plan, site plan, LS of stream, cross section of stream at site of bridge and at 30 metres upstream and downstream etc.
8. Cross sections of the stream within 250 M. upstream and down stream where the stream is appreciably narrower than the proposed site (if any)
9. Rough cost estimate with break up of cost under major heads viz, land acquisition, EW, pavement, surfacing, protective works, cross drainage works as per Appendix 3.13 b.
10. Timeframe to complete proposed project

Appendix 1600 B3

(Details to be incorporated in Preliminary Project Reports for Buildings)

1. Name of Work and Scope
2. Authority and Plan Provision
3. Climatic, Geographic and Historic details
4. Necessity/Justification for the building
5. Details of Existing Facilities and Structures
6. Engineering aspects giving
 - i. Site condition
 - ii. Accessibility viz. approaches roads and internal roads within colonies.
 - iii. Nature of terrain
 - iv. Sub soil particulars
 - v. Prevailing winds
 - vi. Type of buildings proposed
 - vii. Type of foundation suggested
 - viii. Proximity to water and power supply
7. Plans viz, Index map, site plan with layout and line plan of the buildings.
8. Rough cost estimate as per Appendix 3.13 c

Note: i. The sites for buildings shall be chosen in consultation with the Department for which it is constructed.

ii. For major buildings, the site shall be selected only after inspection of prospective sites by the Superintending Engineer and the Chief Architect. The proposal shall conform to the development plan if any prepared for the area by the Town planning or any other development authority.

iii. The by laws or building rules of the Corporation, Municipality or other Local Body or Development Authority, as the case may be shall be complied with, in regard to the set back line, free space around building etc.

iv. In the case of buildings to be put up within 5 km of existing aerodrome, the height of the building shall be restricted by Rules laid down in this regard by the Ministry of Transport and communication (Dept. of Civil Aviation).

v. Shall be consistent with provisions of National Building Code 2005

Appendix 1600 C

Docket sheet (preliminary report / detailed report)

Kerala Public Works Department

Circle..

Division..

Sub Division.

Section..

1. Name of work:

2. Amount of Administrative Sanction *:

3. Reference to Administrative Sanction *:

4. Source of funds:

5. Head of classification as per viz. major head, minor head, departmental head and the service head :

6. Recommendation/Orders of the Assistant Engineer

Submitted to the Assistant Executive Engineer

Signature of the Assistant Engineer (with date)

7. Recommendation/Orders of Assistant Executive Engineer

Submitted to the Executive Engineer

Signature of Asst. Executive Engineer (with date)

8. Recommendation /Orders of the Executive Engineer.

Submitted to the Superintending Engineer

Signature of Executive Engineer (with date)

9. Recommendations/Orders of the Superintending Engineer**

Submitted to the Chief Engineer

Signature of Superintending Engineer (with date)

10. Recommendations/ Orders of the Chief Engineer.**

*Only for Detailed Reports

**only wherever applicable

Note: - Certificates as detailed under 6.2.2 shall be recorded in the docket sheet along with the recommendations.

Appendix 1600 D Checklist for Detailed Estimate Report

1. Name of Work and Scope
2. Authority and Plan Provision with details of administrative sanction
3. Climatic, Geographic, Environmental, Historic, Social details
4. Necessity/Justification (with traffic counts for R& B Works)
5. Pavement and Shaller Condition (for R& B Works)
6. Cross drainage requirements and details (for R& B Works)
7. Rehabilitation works, diversion of utilities.
8. Details of land acquisition, demolition, Resettlement and Rehabilitation etc.
9. Timeframe to complete proposed project
10. Detailed drawings and designs
11. Itemised detailed estimate

* Note :

- (1) An estimate report explaining the location, length of roads and other salient features of the works proposed, and a site plan shall be furnished.
- (2) All the items indicated in the model estimates may not be required in all cases. Where an item is not required, it may be indicated as 'Nil'.
- (3) The standard specification laid down for different classification of roads and bridges and standing circular orders shall invariably be followed while proposing the works under various sub heads in the model estimates.
- (4) *Under 'Land Acquisition'* the area of land, plinth area, or other relevant details of the structures to be acquired and approximate costs for shifting lines shall be furnished.
- (5) *'Under General Improvements'* the quantity of earthwork, and rock blasting (Approximate) shall be furnished.
- (6) In the case of retaining walls, the section proposed, height and the type of construction i.e. D. R. or Masonry, the length etc., shall be indicated.
- (7) In the case of culverts, the span, or the size of the culverts shall be furnished.
- (8) In the case of small bridge works, which form part of a road work, the span, width of roadway etc., shall be noted.
- (9) For *"Surfacing"* the formation width of the roadway, width of soling and/or metalling/ gravelling, width and type of blacktopping, and the length shall be furnished.
- (10) In the model estimate for bridges, in addition to the points mentioned above the following points shall also be noted.
 - (a) Under 'Foundation', the type of foundation i.e. open, Pile or well, size and, No. of piles and/or wells shall be furnished.
 - (b) *Sub-structure.* Type and size of piers and abutments have to be noted.
 - (c) *Superstructure.* Type of decking, width of roadway, span etc., shall be noted.
- (11) With regard to buildings, in addition to the general instructions mentioned above, the following points shall also be noted.
 - (a) If the estimate provides for residential quarters for Government employees, the pay scales of the officers for whom the quarters are intended, shall be furnished.
 - (b) In the case of buildings for accommodating officers, the number of offices, details of staff and other requirements shall be indicated.
 - (c) In the case of other buildings also, like hospitals, hostels etc., full details of requirements shall be given.
 - (d) The possibility of getting adequate supply, of potable water shall be investigated, where there is no protected water supply system

APPENDIX 1600 E

KERALA DEPARTMENT

8 Deviation statement in the course of actual construction of works

Name of work	Sub-heads in which departure occurs	Name of departure		Reason for the deviation	Results anticipated	Orders of the Engineer
		Original or sanctioned arrangement	Arrangements proposed to be carried out			

APPENDIX 1600 F

FORM No. D.B.4-COMPARATIVE STATEMENT (LARGE)

Abstract of original and revised estimates with explanations for difference in quantities and rates

Subheads of estimates and items of works	Original Estimate						Revised Estimate					Explanation				
	Quantity	Rate		Amount	Quantity			Rate	Amount for work				Savings (Minus)	Excess (Plus)		
		Rs	Ps		Rs	Already executed	To be executed		Total	Rs	Ps				Rs	Rs.	Rs

APPENDIX 1800 A

(Vide Para

G. W. D. 156

Register of sanction to estimates for

Technical Sanction No.	Name of work	Amount estimate	of	Reference to Administrative sanction			Source of funds
				Authority	No.	Date	

APPLICATION FOR RENEWAL REGISTRATION AS CONTRACTORS

1. Name of Applicant (In Block letters) :
2. Full Address :

3. Officer to whose application for renewal is :
made
4. Category of Registration :
5. Previous registration No. and the year from :
which the continues to be on the rolls
6. Details of financial capacity (enclose solvency :
certificate on bank guarantee. If the period of
Bank Guarantee already produced in previous
years has elapsed)
7. Particulars of experience on works labour :
command equipment and other facilities on
head and technical assistance available etc.
8. State whether he is registered contractor in any :
other office in the PWD
9. State Whether the applicant was penalized in :
connection with may contract with
Government if so, give details.
10. State whether any of his previous applications :
for registration in any of the officers in Kerala
PWD has been rejects.
11. Enclose copy of Income tax clearance :
certificate
12. State whether the applicant is under this :
employments, dismissed Government servant

Station:

Date:

Signature of Applicant

GOVERNMENT OF KERALA
..... **DEPARTMENT**

Name of Circle
Address and Phone No. :

Name of Division
Address and Phone No. :

CERTIFICATE OF EXPERIENCE

1. Name of Contractor :
- 1.2 Address :

- 1.3 Registration Number :
2. Name of Work :
3. Amount of original contract :
4. Whether Sublet work :
5. Amount of sublet work :
6. Agreement No. and date :
7. Amount of work executed :
8. Stipulated period of completion :
9. Scheduled date of completion :
10. Extended date of completion :
11. Number of extension (s) granted :
12. Final date of completion :
13. Details of major components of the work with quantity and list of machinery used/hired (attach separate sheet if required) :
14. Whether the work was completed satisfactorily :
15. Whether any penalties/fine/Termination :

imposed

- 16. Litigation/Cases/Enquiry pending in :
respect of the work with status
- 17. Defect or liability noted during the :
Guarantee period
- 18. Performance of the contractor : Poor/Satisfactory/Good/V.
Good/Outstanding
- 19. Other remarks if any :
- 20. Name of the officer issuing the :
Certificate

CERTIFICATE

Certified that the details furnished of the

work.....

.....

.....

.....are true.

Signature with Seal

Place:

Date:

APPLICATION FOR REGISTRATION AS CONTRACTOR IN ALL CATEGORIES

1. Name of Applicant (In Block Letters) :
2. Full Address :

3. Office to whom applications is made :
4. In the case of individuals who was :
partners of the firm or in the case of firm
of contractor the following details should
be furnished
- i) Whether the firm in a private/public Ltd. :
Concern or undivided Hindu Family
individual or Regd. Partnership firm
(Attested copies of ded and articles of
association is enclosed)
- ii) Name of partner with their liabilities. :
- iii) Name of person holding Power of :
Attorney
- iv) Place of business :
5. Category to which Regn. Is sought :
6. Details of financial capacity (enclosed :
solvency certificate or bank guarantee)
7. Particulars of experience on works labour :
concerned equipment and other facilities
on head and technical assistance available
to.
8. State whether he is a Regd. Contractor in :
any other office in PWD
9. State whether the applicant was published :
in connection with any contract with
Govt. If so give details.
10. State whether any of the previous :
application for registration in any office
in Kerala PWD has been rejects.
11. State whether the applicant or any of :
partners or shareholders/ is/ are dismissed
Govt. servants
12. State whether the applicant has produced :
plumber/electrical licenses from contract
authority (only in case of contractor
executing the specified type of work)

I have read and understood the rules regarding the Registration of contractor published in G.O (P) 69/PWD dated 25-4-65 and amended from time to time.

Place:

Date:

SIGNATURE OF APPLICANT

<p>Registration No.</p> <div style="border: 1px solid black; height: 200px; width: 100%;"></div>	<p style="text-align: center;">Contractor's Registration Card</p> <p style="text-align: center;">KERALA STATE</p> <p style="text-align: center;">Form III</p> <p>Name..... of (Permanent address) </p>
<p style="text-align: center;">2</p> <p>Of (Temporary address) </p> <p>Of (Changed address) </p> <p>Of (Changed address) </p>	<p style="text-align: center;">3</p> <p>Of (Changed address) Of (Changed address) Of (Changed address) </p>
<p style="text-align: center;">4</p> <p>Of (Changed address) </p> <p>Of (Changed address) </p>	<p style="text-align: center;">5</p> <p>Is/are registered as a contractor under the category The registration No. being </p>

<p>..... </p> <p>Of (Changed address)</p> <p>..... </p>	<p>... Electrical / Non Electrical. The registration is a valid from to Date.....</p> <p style="text-align: right;"><i>Signature & Designation of the Registering Officer</i></p>
<p style="text-align: center;">6</p> <p><i>Note:-</i></p> <ol style="list-style-type: none"> 1. The registration card is to be renewed every two years. 2. Renewal applications are to be submitted in the prescribed form before the 1st January of every year together with an up-to date income tax clearance certificate and fee for Rs As per rules (Non refundable) 3. Renewal applications will however be consider for a further period of one month. ie. Upto 31st January of every year, provided they are accompanied by a fine of Rs. As per rules. 4. While tendering for the work number of registration card shall invariably be referred to produced when called for. 	<p style="text-align: center;">7</p> <p>No. Date.....</p> <p>This Registration is renewed for a period of 2 years from to </p> <p style="text-align: right;"><i>Signature & Designation Of Registration authority</i></p> <p>No. Date.....</p> <p>This Registration is renewed for a period of 2 years from to </p> <p style="text-align: right;"><i>Signature & Designation Of Registration authority</i></p>
<p style="text-align: center;">8</p> <p>No. Date.....</p> <p>This Registration is renewed for a period of 2 years from to </p> <p style="text-align: right;"><i>Signature & Designation Of Registration authority</i></p> <p>No. Date.....</p> <p>This Registration is renewed for a period of 2 years from to </p> <p style="text-align: right;"><i>Signature & Designation Of Registration authority</i></p>	

APPENDIX 2000A

Tender Notice (As per Para 2003)

Tenders are invited from registered contractors for the following works. -

Sl No.	Name of work	Probable amount of contract	Period of completion	Earnest money	Cost of tender form & where available	Last date of sale of tender form	Date of receipt of tender	Office where tender should be submitted	Remarks
1	2	3	4	5	6	7	8	9	10

Place.

Designation

Date.

APPENDIX 2000B

Register of Tenders (As per Para 2009.1)

Sl No

Tender number

Tender Opening Date & Time.

Name of Work

PAC and EMD

No	Name & address of tenderer	Registration No. of tenderer	Details of EMD	Quoted rate/percentage excess or deduction in case of percentage rate contract/total quoted amount of contract as entered in the tender in case of schedule rate contract and L.S. contract (In words & Figures)	Signature of contractor or representative present	Remarks
----	----------------------------	------------------------------	----------------	---	---	---------

Signature of Engineer

Here enter the nature of final disposal of the tender:

Appendix 2000C

PROFORMA TO ACCOMPANY RECOMMENDATION FOR ACCEPTANCE OF TENDER EXCESS

1. Name of work in full:					
2. Brief description of work:					
3. Name of Circle:					
4. Name of Division/Sub Division/Section:					
5. Details of A.S.					
(a) A.S. No. and date					
(b) Amount of estimate:					
(c) Issuing Department:					
6. Whether aided scheme/Centrally Sponsored/ Electrification works State Highway/N.H. etc./Quarters Public building etc./M.I.					
7. Details of T.S.					
(a) No. and date					
(b) Amount of estimate:					
(c) Issuing Authority:					
8. Details of Budget provision:					
(a) Budget Head:					
(b) Budget provision (Denote year also):					
(c) Item No. and page No.					
(d) Amount required for land:					
Acquisition and other commitments:					
9. Whether land required for the work is already taken possession:					
10. If tendered earlier, details there of:					
11. Nos. of Tender & forms:					
12. Nos. of tenders received:					
13. Estimate RA.C.					
14. Value of Departmental materials:					
15.Sl.No.	Name of contractor	Class of Registration	Percentage excess quoted less cost of dept. materials	Amount less cost of departmental materials	Contract PAC
16. Whether sufficient EMD has been furnished by all Tenderers					
17. Details of contractor whose tender is recommended for acceptance					
(a) Name and address:					
(b) Class of Registration:					
(c) Whether he is qualified to execute the work					
18. Year of Schedule of rates followed for preparing estimate					
19. If current schedules of rates is not followed, state reason there of					
20. Whether sufficient publicity and time were given for submission of tenders					
21. Details of publication in detail with date of insertion					
22. Last date fixed for receipt of tenders:					
23. Date of expiry of firm period:					
24. Date of receipt of tenders in Circle/ Division/Sub Division/Section office					
25. Whether any attempt has been made to get the quoted rates reduced. If so the result of each attempt at each level					
26. Specified reason for recommending a high rate					
27. Whether re-tender is advisable if not, the reasons there of					
28. If a balance work, furnish the following:					
(a) Physical percentages of work already completed					
(b) Reasons for re arrangement:					
(c) Details of revised estimate sanctioned if any, with a amount sanction No. and percentage excess:					
(d) Year of schedule of rates/ based on which balance works are arranged					
(e) Whether the work is arranged at risk and cost:					
(f) If not state reasons there of:					
29. In case of Quotations/Negotiated quotation furnish the following details					
(a) Whether tenders were invited originally and if so details of each call and response there of					
(b) If it is a case of waiving a tender call, reasons there of					
30. Recommendation of the officer who has invited the tender					

Submitted to the
of the officer (with date)

Signature

Recommendation of
(Intermediate officers)

(The same column shall be repeated for use all intermediate officers who recommend the tender excess)

Submitted to the
Signature of officer (with date)

ANNEXURE – 2000D

Application for Release of Security Deposit (As per Para 2009.7 & 2009.8)

1. Name of Work :
 2. Name and address of contractor :
 3. Agreement No. :
 4. Probable amount of contract :
 5. Date of commencement :
 6. Actual Date of completion :
 7. Amount of Security deposit and details of Remittance :
 8. Signature of contractor with date :
(Item 1 to 8 to filled up by the contractor)
 9. Recommendation / Orders of the Assistant Engineer
Submitted to the Assistant Executive Engineer. Signature of Assistant Engineer
(with date)
 10. Recommendation / Orders of the Assistant Executive Engineer
Submitted to the Executive Engineer Signature of Asst. Exe. Engineer
(with date)
 11. Recommendation / Orders of the Executive Engineer
Submitted to the Superintending Engineer Signature of Executive Engineer
(with date)
 12. Order of the Superintending Engineer
Signature of Superintending Engineer (with date)
- (Score out columns not applicable)
13. Released on _____ Date

APPENDIX 2000E

Register of Agreements (As per Para 2010)

SI No	Date of agreement	Agreement No/ Supplemental agreement No.	Name of work	Name of contractor	PAC	Date of completion/ Extended Date of Completion	Extension/ Extra item Sanctioning Order and date	Remarks	Signature
	2	3	4	5	6	7	8	9	10

APPENDIX 2000F

Register of custody of Agreements (As per Para 2010)

Register of Agreement in the custody of

SI No	Date of receipt of agreement	Agreement No and Date	Name of work	Name of contractor	PAC	Date of completion/ Extended Date of Completion	Remarks	Signature
1.	2.	3.	4.	5.	6.	7.	8.	9.

APPENDIX 2100A
(Referred to in Para 2102.1)

ACKNOWLEDGEMENT FORM OF HANDING OVER THE SITE TO THE CONTRACTOR

Shri. (Name of Contractor)

1. Name of work
2. Estimate amount
3. Agreement No.

I have this day..... taken over the site for the above work subject to the conditions in the notes below.-

Taken over
Contractor's signature with date

Countersignature of Assistant Engineer with date

Submitted to the Assistant Executive Engineer/Executive Engineer.

NOTE:- (1) Handing over site in this context would imply making available the site for the contractor and his agents, workmen etc., to enter the site and carry on the work entrusted to him.

(2) This does not mean occupancy right in the normally accepted sense of the word.

(3) In respect of maintenance work and works of additions and alterations to existing structure, the contractor's right of entry to the site and carrying on the work should be so exercised as not to cause hindrance or disturbance to the existing structures or occupants / Traffic in case of road works thereof.

(4) The Contractor should vacate the site and clear it of all debris etc., on completion of the work or when the contract is terminated.

APPENDIX 2100B

Sample Form of Work spot Order Book (As per Para 2105)

Name of Division.....

Book No.....

INSTRUCTIONS

1. The work spot order book is to be maintained in all cases when the estimated cost of work exceeds the TS powers of the Assistant Engineers.
2. This Book will be maintained by the Work Superintendent/Overseer posted for supervision of the work and he will be responsible for its proper maintenance and safe custody.
3. After completion of the work, the book will be recorded in the office of the authority who gives technical sanction to the work.
4. Each book will be numbered serially and an account of the books maintained in the Division Office.
5. The orders issued by the inspecting officers shall be recorded in the work spot order book. If such orders are beyond his competence, the officer issuing the orders shall address the appropriate authority and obtain ratification. The instructions and orders issued through the work spot order book will be binding on the departmental subordinates at site. The Overseer shall submit copies of the instructions to the Assistant Engineer. The Assistant Engineer shall communicate copies of instructions to be complied with by the contractor to him in writing.
6. The instructions and orders issued through the work spot order book are binding on the departmental subordinates in charge of the concerned work. The subordinate keeping the book, to the Junior Engineer and Assistant Engineer, should send copies of orders noted in the work spot order book. So far as the Contractor is concerned, all-important instructions should also be intimated in writing to him.
7. The officers, as and when they inspect the work shall record their views in the work spot order book.
 1. Name of work
 2. Estimated cost
 3. Do P.A.C
 4. Agency for the work
 5. No. and date of agreement

6. Date of handing over site

7. Date of commencement

8. Date of completion

AGREED SCHEDULE OF PROGRESS OF WORK

INCUMBENCY OF OFFICERS IN CHARGE OF WORK

Overseer		Assistant Engineer		Assistant Executive Engineer		Executive Engineer	
Name	Period	Name	Period	Name	Period	Name	Period

PROGRESS OF WORK

Month Progress

TOOLS AND PLANT AT SITE

INSPECTING OFFICERS ORDERS AND INSTRUCTIONS

Date and time of inspection	Name and Designation of the Officer	Orders and instructions issued
-----------------------------	-------------------------------------	--------------------------------

Appendix 2100C1

Sample progress report for Budgeted works (As per para 2106)

Progress Report for the Month of _____ 20__

Name of Office _____

Sr. no.	Name of Work	Budget Item no.	Agreement No.	Date of completion	Estimate PAC (Rs)	Agreed PAC (Rs)	Work done this month(Rs.)	Cumulative work done (Rs)	Financial Progress (%)	Stage of work	Physical Progress (%)	Reason for delays if any	Expected date of Completion	Remarks
---------	--------------	-----------------	---------------	--------------------	-------------------	-----------------	---------------------------	---------------------------	------------------------	---------------	-----------------------	--------------------------	-----------------------------	---------

Signature

Date

Appendix 2100C2

Sample progress report for non budgeted works (As per para 2106)

Progress Report for the Month of _____ 20__

Name of Office _____

Sr. no.	Name of Work	Budget Item no.	Agreement No.	Date of completion	Estimate PAC (Rs)	Agreed PAC (Rs)	Work done this month(Rs.)	Cumulative work done (Rs)	Financial Progress (%)	Stage of work	Physical Progress (%)	Reason for delays if any	Expected date of Completion	Remarks
---------	--------------	-----------------	---------------	--------------------	-------------------	-----------------	---------------------------	---------------------------	------------------------	---------------	-----------------------	--------------------------	-----------------------------	---------

Signature

Date

APPENDIX 2100D

SAFFTY CODE (As per para 2107)

1. Suitable scaffolds shall be provided for workmen for all work that cannot safely be done from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used an extra mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well, suitable footholds and hand- holds shall be provided on the ladder and the ladder shall be given an inclination not steeper than $\frac{1}{4}$ to 1 ($\frac{1}{4}$ horizontal and 1 vertical).

2. Scaffolding or staging more than 3.25 metres above the ground or floor, swung or suspended from an overhead support or erected with stationery support, shall have a guard rail properly attached, bolted, braced and otherwise secured at least 1 meter high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structures.

3. Working platform, gangways, and stairways shall be so constructed that they do not sag unduly or unequally, and if height of a platform or gangway or stairway is more than 3.25 meters above ground level or floor level, it shall be closely boarded, have adequate width and be suitably fenced as described in 2 above.

4. Every opening in floor of a building or in a working platform shall be provided with suitable means to prevent fall of person or materials by providing suitable fencing or railing with a minimum height of 1 meter.

5. Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 metres in length. Width between side rails in ,a rung ladder shall in no case be less than 30 cm. for ladders upto and including 3 metres in length. For longer ladders this width shall be increased at least 6 mm. for each additional 30 cm. of length. Uniform step spacing shall not exceed 30 cm.

Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The contractor shall provide all necessary fencing and lights to protect public from accidents and shall be bound to bear expenses of defense of every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and costs which may be awarded in any such suit, action or proceedings to any such person or which may with the consent of the Contractor be paid to compromise any claim by any such person.

6. *Excavation and Trenching.*-All trenches, 1. 5 metres or more in depth shall at all times be supplied with at least one ladder for each 30 metres in length or fraction thereof. Ladder shall be extended from bottom of trench to at least 1 meter above surface of the ground. Sides of a trench which is 1. 5 metres or more in depth shall be stepped back to give suitable slope, or securely held by timber backing, so as to avoid the danger of 1.5 meters of edge of trench or half of depth of trench, whichever is more. Cutting shall be done from top to bottom. Under no circumstances shall undermining or undercutting be done.

7. *Demolition.*-Before any demolition work is commenced and also during the process of the work:-

(a) All roads and open areas adjacent to the work site shall either be closed or suitably protected;

(h) No electric cable or apparatus which is liable to be a source of danger over a cable or apparatus used by operator shall remain clerically charged;

(c) All practical steps shall be taken to prevent danger to persons employed, from risk or fire or explosion, or flooding. No floor roof or other part of a building shall be so overloaded with debris or materials as to render it unsafe.

8. All necessary safety equipment as considered adequate by the Engineer-in-charge shall he available for use of persons employed on the site and maintained in a condition suitable for immediate use; and the Contractor shall take adequate steps to ensure proper use of equipment by those concerned.

(a) Workers employed on mixing asphaltic materials, cement and lime mortars/concrete shall be provided with protective footwear and protection goggles.

- (b) Those engaged in handling any material which is injurious to eyes shall be provided with protective goggles.
- (c) Those engaged in welding works shall be provided with welder's protective eye shields.
- (d) Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.
- (e) When workers are employed in sewers and manholes, which are in use, the Contractor shall ensure that manhole covers are opened and manholes are ventilated at least for an hour before workers are allowed to get into them. Manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to public.
- (f) The Contractor shall not employ below the age of 18 and women on the work of painting with products containing lead in any form. Whenever men above the age of 18 are employed on the work of lead painting, the following precautions shall be taken:
- (i) No paint containing lead or lead products shall be used except in the form of paste or readymade paint.
- (ii) Suitable face masks shall be supplied for use by workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scraped.
- (iii) Overalls shall be supplied by the Contractor to workmen and adequate facilities shall be provided to enable working painters to wash during and on cessation of work.
- 9 When work is done near any place where there is risk of drowning all necessary equipment shall be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.
10. Use of hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following:-
- (a) (i) These shall be of good mechanical construction, sound material and adequate strength and free from patent defects and shall be kept in good repair and in good working order.
- (ii) Every rope used in hoisting or lowering materials or as means of suspension shall be of durable quality and adequate strength and free from patent defects.
- (b) Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years shall be in charge of any hoisting machine including any scaffold winch or give signals to operator.
- (c) In case of every hoisting machine and of every chain ring hook, shackle swivel and pulley block used in hoisting or lowering or as means of suspension, safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with safe working load. In case of a hoisting machine having a variable safe working load, each safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or of any gear referred to above in this paragraph shall be loaded beyond safe working load except for the purpose of testing.
- (d) In case of departmental machine, safe working load shall be notified by the Engineer-in-charge. As regards Contractor's machine the Contractor shall notify safe working load of each machine to the Engineer-in-charge, whenever he brings it to site of work and get it verified by the Engineer-in-charge.
11. Motors, gearing, transmission electric wiring and other dangerous parts of hoisting appliance shall be provided with efficient safeguards, hoisting appliances shall be provided with such means as will reduce to the minimum risk of accidental descent of load, adequate precautions shall be taken to reduce to the minimum risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical insulations which are already energised, insulating mats, wearing apparel such as gloves, sleeves and boots, as may be necessary, shall be provided. Workers shall not wear any rings, watches and carry keys or other materials, which are good conductors of electricity.
12. All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in a safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities shall be provided at or near place of work.

13. These safety provisions shall be brought to the notice of all concerned by display on a notice board at a prominent place at the workspot. Persons responsible for ensuring compliance with the safety code shall be named therein by the Contractor.

14. To ensure elective enforcement of the rules and regulations relating to safety precautions, arrangements made by the Contractor shall be open to inspection by the Engineer-in-charge, or his representatives and the Inspecting Officers.*

15. Notwithstanding the above conditions 1 to 14 the Contractor is not exempted from the operation of any other Act or Rules in force.

*'Inspecting Officer' means any Labour Enforcement Officer or Assistant Labour Commissioner of the Chief Labour Commissioner's Organisation

Appendix 2100E1

MEASUREMENT BOOK (As per para 2109)

Circle/Division

Subdivision/Section

Measurement Book No

Notes

1. The measurement book is the basis of all accounts of quantities, whether for work done by piece work for by contract, or of materials received for specific works which have to be measured, and should be so kept that the transaction may be readily traceable into the accounts.

2. (a) Measurements shall invariably and neatly be recorded direct in the measurement books at site, and not copied into them later on at leisure, from measurement sheets.

(b) Erasures and over writings in the measurement books are strictly prohibited and will be seriously noticed. If mistakes are made, they should be corrected by neatly scoring off the incorrect entries and inserting the correct once between the lines. Dated initials of the recording officer shall be insisted on, on each page of the measurement book in the case of original entries, and initials, in the case of each and every correction. In the case of contract work, the contractor's signature should be taken in the measurement book in token of the contractor's acceptance of the measurements recorded either at the time of measurement or in any case, before payment, to avoid complaints of omissions, incorrectness, etc.

3. (a) No officer below the rank of a 2nd Grade Overseer in responsible charge of a work, is empowered to measure a work and make either an entry or a correction in the measurement books in respect of particulars, measurements or rails. Measurements relating to all supplies and services shall also be recorded by the 1st grade overseer/ 2nd grade overseer. No member of the clerical staff except the account section responsible for the preparation and checking of the bills, is allowed to make arithmetical corrections. Such corrections noticed in the preparation of bills, shall be invariably attested by the bill preparing officer, while those noticed during audits shall be attested by the Passing Officer. The store-keepers in charge of departmental stores may be permitted to record supply bills, and conveyance charges of stores moved to and for, in measurement books issued to them.

(b) The theoretical issue of departmental materials and receipts and issues of other items based on measurements against each item in a bill shall be noted in remark column by a technical subordinate while preparing a work bill and during audit.

(c) The officer to whom a measurement book is issued shall be its custodian until it is finally returned to the Sub Division office for record after completion or transferred in the meantime by official transfer, to his successor on relief. Except when the book is sent officially to other offices for preparation, audit and payment of bills, book must always be kept in the personal custody of an officer not below the rank of a Lower Division Clerk.

4. (a) For easy identification and check, the descriptions of the locality and items must be lucid; and the measurements shall be recorded systematically item by item of the sanctioned estimates noting also the respective item numbers. The total of the quantities under the different items as entered in the quantity column of the measurement book should be in the case of each bill, an up-to-date quantity and not a 'since last' quantity.

(b) For large works separate measurement books shall be kept by the measuring officer for each individual work or contract, or if found necessary or convenient separate books may be set apart for different classes of works or subheads of works, in which himself and the checking officer will have with them at the time of any measurements or check measurement all the previous measurement in one and the same book for easy reference and guidance. Promiscuous recording of measurements of one and the same work indiscriminately in different measurement books, is prohibited and if resorted to will be seriously noticed.

5. In the case of extra items or extra rates, the orders sanctioning its execution or provision should invariably be quoted in the measurement books and bills before the auditing wing passes such claims for payment. The measuring officer may however record extra items if any in the measurement book if he is satisfied that they are covered at least by the written orders of the inspecting officers in the workspot order book though not at the time of measurement regularised by the formal sanction of the competent authority. The audit wing will all the same defer passing of such items until formal sanction is secured. Such items will however be entered in the quantity columns but the rates and amounts will be noted therein only on receipt of formal sanction from sanction of competent authority to such items. This stipulation is precautionary to ensure that the measurement and check measurement of extra items which it may be difficult or impossible to measure at a later stage of work should not be lost sight of, while closing or checking interim bills or at the time of final payment.

6. The measuring officer shall be responsible for closing the bills in the measurement books and taking care to enter therein correctly, all references previous measurements and all receipts and issues of materials utodate and effect all recoveries, they shall be observed as an orthodox rule, as the measuring officer is primarily and wholly responsible for all entries made by him in the measurement book and for the bills as corrected and finally passed by on for audit on the basis of those measurements. In fact the bill will be an exact copy of the closing abstract as made out by the measuring officer, in the measurement book.

7. From the measurement book all quantities should be clearly traceable to the documents on which payments are made reference to voucher in which the quantities are entered for payment as well as date of entry should be given by endorsement upon the original entries in the measurement book. No contract certificate or bill should be signed without crossing out the connected entry in the measurement book and the document on which the payment is made should invariably bear a reference number and page of the book in which detailed measurements are recorded.

8. The measurement books are thus one of the most important initial records relating to the execution and payment of works, they should be carefully checked by Divisional/ Sub divisional officer to see that they are kept as per complete records of each kind of work done for which certificates have been granted. The eventual return of all books to the division office for record should be insisted upon.

9. Name of officer and check measuring officer shall be noted below the signature.

Name of Work:

Date of measurement

Name of contractor

Agreement No.

Reference to estimate		Particulars		1	2	3	4	5	6	7	8			9		Remarks
Sub head	Item no	Measurement up-to-date						Rate	Total value to date	Deduct previous measurement			Since last measurement			
		No	L	B	D	Contents or area	Rs	p	Rs	p	book	Page	quantity	Quantity col (5-8)	Value at rate in col. 6	
															Rs	p

Appendix 2100E2
Level Field Book (As para 2109)

Rules to be observed in leveling and survey operations

1. In all surveys the survey line should be shown with a fine red line that it may be at once apparent with what degree of accuracy a plan has been made.
2. It is also directed that on every convenient occasion tie lines shall be introduced to check the general accuracy of the work
Though the features of the ground may not need these tie lines for filling in detail, they must not be omitted, as the general accuracy of survey is the chief point to be ensured
3. It is further directed that all levels should be checked either by returning to the point originally started upon or by closing on a bench mark known to be accurately determined. Under no circumstances shall levels be run from one point to another without the accuracy of the work being inconsistently proved.
4. The adjustments of instruments including chains and tapes, should be checked and if necessary adjusted before using. Field book level or survey must be carefully preserved records. Under no circumstances shall any page or part of a page be torn from the book. Entries shall invariably and neatly be recorded direct in the field book in ink at site. Pencil entries should be avoided but if unavoidable these shall be in indelible pencil and shall not be inked in, but left untouched. Erasures and overwriting s in the field book are strictly prohibited. And will be seriously noticed. Any mistakes made should be neatly scored off and corrected in red ink between lines. Dated initials of the recording officer are to be insisted on, on each page of field book in the case of each and every correction.
5. The greatest care must be exercised in the use of optical instruments. Peons or lascars must on no account be allowed to touch an instrument beyond in the actual carriage of it, and then it should be seen that the instrument is being conveyed in a proper way o avoid injury. The officer using an optical instrument must take it out of its box and return thereto with his own hands. Instrument boxes should always be kept locked and the key kept in the custody of the officer in charge, who is responsible for all instruments issued to him.

Propose:

Locality

Date:

Name of officer

Back Sight	Intermediate Sight	Foresight	Height of Collimation	Reduced Level	Distance	Remarks

Appendix 2100F

Proforma to Accompany Recommendation for Extension of Time of Completion (As per para 2212)

1. Name of work with estimate amount :	
2. Agreement number and date :	
3. Name of contractor :	
4. Date of commencement as per agreement :	
5. Date of completion as per agreement :	
6. (a) 1st extension :	
(b) 2nd extension :	
7. Date upto which extension is now applied for :	
8. Whether ground for extension applied is default by the contractor. If not, specify the grounds on which extension is applied	
9. Present stage of work with percentage of progress so far achieved	
10. Whether fine has been realised for previous extension. If so furnish details	
11. Period of extension now recommended :	
12. Fine proposed :	
13. Recommendations :	

Assistant Engineer

Assistant Executive Engineer
Executive Engineer

Appendix 2100G
CERTIFICATE OF COMPLETION OF WORK (As per para 2113)

Name of Work :
Name of contractor :
Contract Agreement No. and date :
Supplemental Agreement No. and date :

Certified that the works as per the above contract agreement and supplemental agreements have been completed in all respects on The certificate does not however absolve the contractor from any of the liabilities for which he is responsible as per terms of the contract.

..... Engineer

APPENDIX - 2200

2217. EXECUTION – ROADS

This section provides a guide to the correct construction practices and procedures for use on road contracts. Throughout the site (the area where the works are being constructed) the contractor is responsible for supplying all the necessary signs and other equipment to ensure the smooth and safe flow of traffic. The construction shall be carried out in a safe and controlled manner to prevent damage to vehicles and the general public from construction equipment, site materials and activities.

2218. General

2218.1. Key Points

- Before any construction the roadway must be cleared of all vegetation and trees, including their roots removed.
- Cross sections shall be taken prior to any excavation works.
- Finalize cross section of the alignment and levels prior to excavation.
- All construction works must be carried out in as safe a manner as possible.
- Excavated materials, if suitable, shall be used wherever possible in the works.
- Provision has to be made for drainage of the temporary and permanent works.
- Soil containing vegetable matter shall not be used as fill material.
- Borrow pits shall not affect the stability of the road, or any other structure.

Details to be submitted for Approval from Engineer to start work are as per Appendix 2200 E

2219. Setting Out

The working Bench Marks tied with the Reference Bench Mark, wherever necessary, shall be established before commencement of the work. The working Bench Marks shall be at the rate of four per km and also at or near all drainage structures over-bridges and underpasses. An up-to-date record of all bench marks including approved adjustments, if any, shall be maintained by the Assistant Engineer. The lines and levels of formation, side slopes, drainage works, carriageways and shallers shall be carefully set out and frequently checked during construction, care being taken to ensure that correct gradients and cross sections are obtained everywhere.

In order to facilitate the setting out of the works, the centerlines of the carriageway or highway must be accurately established based on the investigation report (as specified in chapter 2 of section 3), in every 30 m or less intervals in plain and rolling terrains and 20m intervals in hilly terrain and in all curve points with marker pegs and chainage boards. On construction reaching the formation level stage, the

centerline shall be set out again to avoid any deviation from the approved centre line. No reference peg or mark shall be moved or withdrawn and no earthwork or structural work shall commence until the centre line has been referenced and approved by the Assistant Engineer.

2220.Public Utilities

The Assistant Engineer shall prepare drawing showing the affected services like water pipes, sewers, oil pipelines, electric lines and posts, telephone lines, cables, gas ducts etc owned by various authorities including Public Undertakings and Local Authorities. He shall do this by collecting necessary details of such utilities in the site or in consultation with the concerned departments and joint inspection wherever necessary. These drawings shall be finalized during the tender stage and utilities are to be shifted before the commencement of the work. The improvement and upgradation of the roads are important for the community; hence all departments/authorities using PWD land must co-operate to shift the utilities in time.

2221.Clearing of Site:

Clearing of site by dismantling old bridges and culverts and existing pavements shall be as per section 200 of MoRTH.

2222. Excavation

This work shall consist of excavation, removal and satisfactory disposal of all materials necessary for the construction of roadway, side drains and waterways in accordance with the lines, grades and cross-sections shown in the drawings or as indicated by the Engineer. Excavation for road works shall conform to the specifications of Section 300 of MoRTH. It shall include the hauling and stacking of or hauling to sites of embankment and subgrade construction, suitable cut materials as required, as also the disposal of unsuitable cut materials in specified manner, trimming and finishing of the road to specified dimensions or as directed by the Assistant Engineer.

2222.1. Classification of excavated material

The excavated materials shall be classified as specified in section 301.2.1 of MORTH.

2222.2.Authority for classification

The classification of excavation shall be proposed by the Assistant Engineer and got approved by the Assistant Executive Engineer.

2222.3.Road Formation in Cutting

Where hard strata are available, and the formation level is below existing ground level, excavation shall be done with due consideration of the stability of slopes. Benching may be resorted to wherever necessary and other suitable slope protection provided. In case of rocks the provisions of clause 301.3.5 and 301.6 of MoRTH shall apply.

2223.Embankment construction

2223.1.Key Points

- All fill materials must be free from vegetable matter and the material must be approved as suitable.
- The material shall be of an appropriate nature and at moisture content that permits compaction to form a stable layer.
- Generally embankments shall be constructed in 150 mm compacted layers parallel to the finished grade of the road.
- For each completed layer the density shall be checked (One test for each 1,000 square meters) by laboratory personnel. If test results show the required density is not achieved further compaction is necessary
- Any soft areas must be rectified before further material is placed. Each earthworks layer requires to be approved before the next layer can be started.

All embankments, subgrades, earthen shallers and miscellaneous backfills shall be constructed in accordance with the lines, grades, and cross-sections shown on the drawings or as directed by the Assistant Engineer. It shall follow the specification as per clause 305 of MORTH

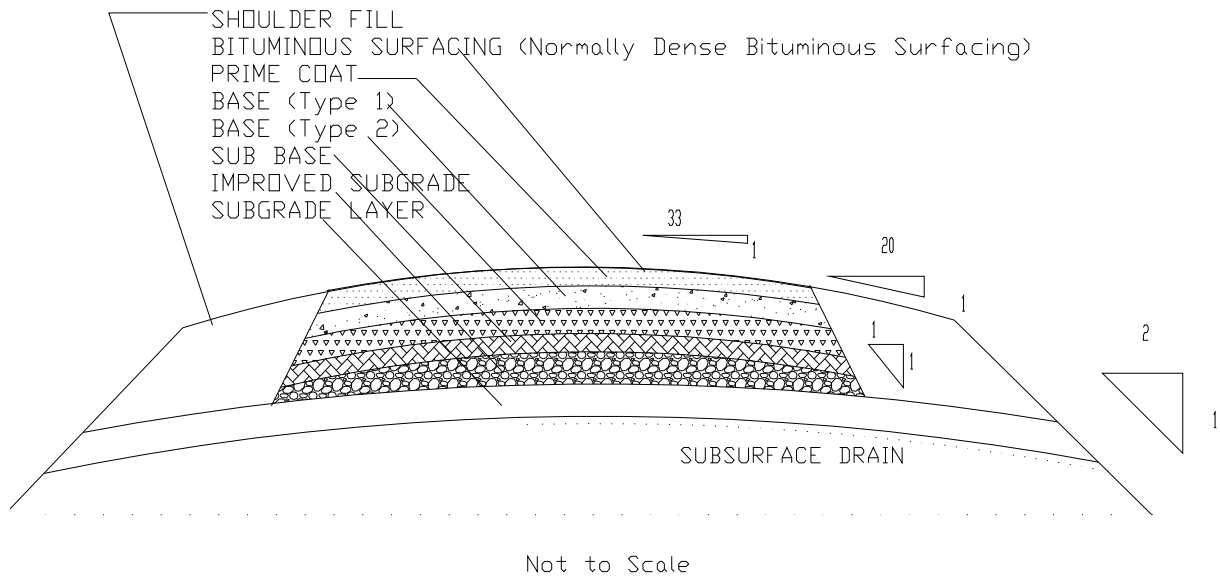


Figure 4.1 Pavement Layers

2223.2. Sub grade

The sub grade is the layer of embankment immediately below the pavement. This may be undisturbed local material or may be soil excavated elsewhere and placed as fill. In either case it has to be prepared to give added strength. All subgrade material must be free of vegetable matter. The material also needs to be of a type and moisture content that it can be compacted to form a stable layer. If the material in the subgrade level is found to be unsuitable, this must be excavated and replaced with suitable material, which shall then be compacted. The subgrade must be prepared over the full width of the embankment, including the shoulders. This is generally carried out in lengths of greater than 100 metres. In some cases to maintain traffic, part width working may be necessary. If this is the case it is vital that the full width of the embankment meets the subgrade material and compaction requirements. When the road is to be placed on existing material, this shall be fully loosened to a depth of 150 mm below the subgrade level. Any lumps shall be removed or broken up to be less than 50 mm in size. The subgrade must be compacted uniformly by use of adequate and appropriate compaction equipment. The material shall be at moisture content close to optimum throughout the layer so that it can be compacted to produce a dense compacted layer. Generally the compaction shall begin at the outer edges of the embankment and by rolling in a longitudinal direction gradually progress towards the centre so that each section receives equal compaction.

Laboratory tests shall be performed as specified in the chapter on Quality control.

2223.3. Drainage

The surface of the embankment/subgrade at all times during construction shall be maintained at such a cross fall (not flatter than that required for effective drainage of an earthen surface) as will shed water and prevent ponding. For this surface drains and subgrade drains shall be provided.

2223.4. Surface drains

Drains shall follow the slope of embankment. Surface drains shall be excavated to the specified lines, grades, levels and dimensions to the requirements of Clause 309 of MoRTH Specifications for Road and Bridge works.

2223.5. Sub grade Drains

Sub grade drains are constructed to ensure that water in the pavement, which would weaken the road, is allowed to drain away. Subgrade drains shall be extended to the edge of the embankment with drains on opposite sides of the road being staggered. In case of roads with minimal longitudinal fall it is often better to install subgrade drains longitudinally at the edge of the road pavement, see Figure 4.1

Subgrade drains shall be excavated by hand in the prepared subgrade. The excavation shall be filled with clean sand or gravel, which contains no vegetable matter, silt or clay. The backfill must be compacted by hand ramming and struck off level with, or slightly above, the finished subgrade level. The finished backfill must be immediately covered with an approved separator material. The separator material is normally specified and will be woven rot proof fabric, geo-textile membrane or perforated heavy duty polythene sheeting. The separator material shall extend 150mm beyond the edges of the drain on all exposed faces. Any joints in the fabric shall overlap by at least 150mm. Materials over the drain shall be placed by hand for at least 100mm above the separator membrane prior to rolling either the pavement or the shaller materials.

2223.6.Finishing operations

Finishing operations shall include the work of shaping and dressing the shallers /verge/road bed and side slopes to conform to the alignment, level, cross-sections and dimensions shown on the drawings or as directed by the Engineer. Both the upper and lower ends of the side slopes shall be rounded off to improve appearance and to merge the embankment with the adjacent terrain. When earthwork operations have been substantially completed, the road area shall be cleared of all debris, and ugly scars in the construction area responsible for objectionable appearance eliminated.

2224. Sub Base

2224.1. Granular Sub Base

This work shall consist of laying and compacting well-graded material on prepared subgrade in accordance with the specifications. The material shall be laid in one or more layers as sub-base or lower sub-base and upper sub-base (termed as sub-base hereinafter) as necessary according to lines, grades and cross -sections shown on the drawings or as directed by the Assistant Engineer.

The materials to be used, construction operations, surface finish and Quality checks and opening to traffic shall be as per the specifications of MORTH clause 401.

2224.2.Cement treated Soil Sub-Base/Base

This work shall consist of laying and compacting a sub-base/base course of soil treated with cement on prepared subgrade/sub-base, in accordance with the requirements of these Specifications and in conformity with the lines, grades and cross-sections shown on the drawings or as directed by the Engineer.

The materials to be used, construction operations, surface finish and Quality checks and opening to traffic shall be as per the specifications of MORTH clause 403.

2225. Base Course (Non Bituminous)

The following are the base courses (Non Bituminous) usually provided for road works

- Water Bound Macadam Sub –Base / Base
- Sub Base Course: Normally consists of at least one layer of grading I or II materials.
- Base course: Base course is done using Grade III material.
- Crusher-Run Macadam Base
- Crushed Cement Concrete Sub-Base/Base
- Wet Mix Macadam Sub -Base/Base

2225.1.Water Bound Macadam Sub –Base / Base

WBM may be used as Sub Base as well as Base course and also surface course of rural roads. This work shall consist of clean, crushed aggregates mechanically interlocked by rolling and bonding together with screening, binding material where necessary and water laid on a properly prepared subgrade/ sub-base/ base or existing pavement, as the case may be and finished in accordance with the requirements of these Specifications and in close conformity with the lines, grades, cross-sections and thickness as per approved plans or as directed by the Engineer.

It is, however, not desirable to lay water bound macadam on an existing thin black topped surface without providing adequate drainage facility for water that would get accumulated at the interface of existing bituminous surface and water bound macadam. The materials to be used, construction operations,

surface finish and Quality checks and opening to traffic shall be as per the specifications of MoRTH clause 404

2225.2.Crusher-Run Macadam Base

This work shall consist of furnishing, placing and compacting crushed stone aggregate sub-base and base courses constructed in accordance with the requirements set forth in this Specification and in conformity with the lines, grades, thicknesses and cross-sections shown on the plans or as directed by the Engineer,

The materials to be used, construction operations, surface finish, quality checks and opening to traffic shall be as per the specifications of MoRTH clause 410.

2225.3.Crushed Cement Concrete Sub-Base/Base

This work shall consist of breaking and crushing the damaged cement concrete slabs and recompacting the same as sub-base/base course in one or more layers. Where specified, it shall also include treating the surface of the top layer with a penetration coat of bitumen.

The materials to be used, construction operations, surface finish and quality checks and opening to traffic shall be as per the specifications of MoRTH clause 405.

2225.4.Wet Mix Macadam Sub -Base/Base

This work shall consist of laying and compacting clean, crushed, graded aggregate and granular material, premixed with water, to a dense mass on a prepared subgrade/sub -base/base or existing pavement as the case may be. The material shall be laid in one or more layers as necessary to lines, grades and cross -sections shown on the approved drawings or as directed by the Engineer. The thickness of a single compacted Wet Mix Macadam layer shall not be less than 75 mm. When vibrating or other approved types of compacting equipment are used, the compacted depth of a single layer of the sub-base course may be increased to 200 mm upon approval of the Engineer.

The materials to be used, construction operations, surface finish and quality checks and opening to traffic shall be as per the specifications of MoRTH clause 406.

2226. Bituminous Base and Surface Courses

2226.1.General

Bituminous pavement courses shall be in accordance with Specifications of MoRTH clause 501. The use of machinery and equipment mentioned in various Clauses of these Specifications is mandatory, and for more details Manual for Construction and Supervision of Bituminous Works by MoRTH may be referred.

2226.2. Laying Trials

Once the plant trials have been successfully completed as per MoRTH, and approved, the Contractor shall carry out laying trials, to demonstrate that the proposed mix can be successfully laid, and compacted all in accordance with the MoRTH Specifications. The laying trial shall be carried out as per MoRTH Specifications for road and Bridge works.

2226.2.1.Key Points

- Samples of the material along with laboratory test results shall be submitted to the Engineer at least 14 days in advance of a proposed material's use. If approved, the contractor shall then carry out trial mixes. This shall also be tested and approved. No dense bituminous surfacing can occur until both the job mix formula and the trial sections have been approved.
- Thereafter all asphalt work is required to follow the approved Job Mix formula and the procedures established by the approved trials.
- The surface upon which the bitumen or bituminous mixture is to be placed must be thoroughly cleaned immediately before the bitumen or mixture is placed.
- Bituminous materials shall be placed only when the surface is dry, when rain does not appear imminent and when the prepared road bed is in a satisfactory condition.
- The entire surface to be primed must be covered evenly. The distributor shall be cleaned and calibrated to ensure the required rate of spray is achieved. Depending on the nature of the surface

to be primed a light application of water just prior to priming may be beneficial to aid penetration of the bituminous material.

- No bituminous mixtures shall be placed until the prime coat has dried.
- Tack coat may need to be applied to make the road surface sticky prior to the bituminous carpeting layer being placed.
- For Primer Seals and Bitumen Surface Treatments the aggregate must be spread and rolled into bitumen immediately after spraying, preferably rolling shall be by multi tyre rollers.
- Each day dense bituminous surfacing is laid, three Marshall specimens shall be prepared and tested as ASTM D 2041
- Samples to be collected from either the plant or the laid mat, as directed by the Engineer. Samples shall also be taken each day to determine the mix composition (Extraction of bitumen test and grading),
- All equipment proposed to be used by the Contractor are in good condition and operated by competent and experienced operators
- Dense bituminous surfacing must be thoroughly compacted as soon as the material will support the roller without undue displacement or cracking. Excess use of water on the roller drums is to be avoided as this cools the asphalt mat.
- The surface of the mixture after compaction must be close and tight, and free from dragging cracks. Any mixture that is defective shall be removed and replaced with fresh hot material, which shall be compacted immediately.
- After final rolling, samples shall be cut from areas of bituminous surfacing for density and thickness at specified intervals. Where samples have been taken, fresh material must be placed and thoroughly compacted.

2226.2.2. Surface Preparation: Prime coat shall be provided as per Clause 502 and tack coat as per clause 503 of MoRTH specifications.

2227. Base Course (Bituminous)

The different types of bituminous base course are as follows

- Bituminous Macadam
- Bituminous Penetration Macadam
- Built-up Spray Grout
- Dense Graded Bituminous Macadam
- Sand Asphalt Base course

2227.1. Bituminous Macadam

This work shall consist of construction in a single course having 50mm to 100mm thickness or in multiple courses of compacted crushed aggregates premixed with a bituminous binder on a previously prepared base to the requirements of these specifications. Bituminous macadam is more open graded than the dense graded bituminous materials.

The materials to be used, construction operations, surface finish and quality checks and opening to traffic shall be as per the specifications of MoRTH clause 504.

2227.2. Bituminous Penetration Macadam

A penetration Macadam is a compacted layer of coarse aggregates into which bituminous binder is introduced. The binder penetrates in to the layer through the voids and binds the stone aggregates. A layer of small aggregates, called key aggregates, is spread on the surface and rolled so as to fill in the surface voids in the coarse aggregate layer. A seal coat is provided to make the surface more impervious to water. This type is commonly used in remote areas where it is difficult to transport mixing and laying equipment. It can also be used as a temporary emergency material to repair a pavement damaged by rains and floods.

The materials to be used, construction operations, surface finish and quality checks and opening to traffic shall be as per the specifications of MoRTH clause 505.

2227.3. Built-up Spray Grout

This work shall consist of a two-layer composite construction of compacted crushed coarse aggregates with application of bituminous binder after each layer, and with key aggregates placed on top of the second layer, in accordance with the Specifications of MoRTH, to serve as a base course and in conformity with the lines, grades and cross-sections shown on the drawings or as directed by the Engineer. The thickness of the course shall be 75 mm. Built-up spray grout shall be used in a single course in a pavement structure.

The materials to be used, construction operations, surface finish and quality checks and opening to traffic shall be as per the specifications of MoRTH clause 506.

2227.4. Dense graded Bituminous Macadam

It may be used as base/binder and profile corrective courses. Apart from Bituminous Macadam, the only difference is being that the stone aggregates are more closely graded. As a result, the resultant mixture is denser. DBM is also intended for use as road base material. This work shall consist of construction in a single or multiple layers of DBM on a previously prepared base or sub-base. The thickness of a single layer shall be 50mm to 100mm.

The materials to be used, construction operations, surface finish and quality checks shall and opening to traffic be as per the specifications of MoRTH clause 507.

2227.5. Sand Asphalt Base Course

This work shall consist of a base course composed of a mixture of sand, mineral filler where required and bituminous binder, placed and compacted upon a prepared and accepted subgrade in accordance with the Specifications of Clause 520 of MoRTH. The materials to be used, construction operations, surface finish and quality checks and opening to traffic shall also follow the same.

This is used in special situations when quality coarse aggregates are not available within economical leads and/or water needed for conventional base course not being readily available, as in desert areas. 50mm to 100mm.

2227.6. Surface (wearing) Course

The following are the surface (wearing) courses usually adopted.

- Semi dense Bituminous Concrete (SDBC)
- Bituminous Concrete (BC)
- Surface Dressing
- Open grade premix carpet
 - a. Open grade premix carpet using Penetration Bitumen or Cutback.
 - b. Open grade premix carpet using cationic bitumen emulsion
- Mastic Asphalt
- Close graded/ Mixed Seal Surfacing (MSS)

2227.7. Semi dense Bituminous Concrete

This clause specifies the construction of Semi Dense Bituminous Concrete, for use in wearing/binder and profile corrective courses. This work shall consist of construction in a single or multiple layers of semi dense bituminous concrete on a previously prepared bituminous bound surface. A single layer shall be 25mm to 100mm in thickness.

The materials to be used, construction operations, surface finish and quality checks and opening to traffic shall be as per the specifications of MoRTH clause 508.

2227.8. Bituminous Concrete

This clause specifies the construction of Bituminous Concrete, for use in wearing (also used as profile corrective courses) especially for heavily trafficked highways. This work shall consist of construction in a single layer (25mm to 100mm in thickness) of bituminous concrete on a previously prepared bituminous bound surface.

The materials to be used, construction operations, surface finish and quality checks and opening to traffic shall be as per the specifications of MoRTH clause 509.

2227.9 Surface Dressing

This work shall consist of the application of one coat or two coats of surface dressing, each coat consisting of a layer of bituminous binder sprayed on a previously prepared base, followed by a cover of stone chips rolled in to form a wearing course to the requirements of these Specifications. Surface Dressing is used in the case of relatively lightly trafficked roads over gravel or other untreated road bases. It shall be noted that surface dressing is a thin treatment and does not enhance the structural strength of the pavement. If the existing road is full of irregularities and undulations, it does nothing to improve riding quality. Design of Surface Dressing may be referred to in the Manual for Construction and Supervision of Bituminous Works.

The materials to be used, construction operations, surface finish and quality checks and opening to traffic shall be as per the specifications of MoRTH clause 510.

2227.10. Open grade premix carpet

2227.10.1. Open-graded Premix Surfacing using Penetration Bitumen or Cutback.

This work shall consist of the preparation, laying and compaction of an open-graded premix surfacing material of 20 mm thickness composed of small-sized aggregate premixed with a bituminous binder on a previously prepared base, in accordance with the requirements of these Specifications, to serve as a wearing course.

The materials to be used, construction operations, surface finish and quality checks and opening to traffic shall be as per the specifications of MoRTH clause 511.1.

2227.10.2. Open graded premix surfacing using cationic bitumen emulsion

This work shall consist of the preparation, laying and compaction of an open graded premix surfacing of 20 mm thickness composed of small-sized aggregate premixed with a cationic bitumen emulsion on a previously prepared surface, in accordance with the requirements of the relevant Specifications of MoRTH, to serve as a wearing course.

The materials to be used, construction operations, surface finish and quality checks and opening to traffic shall be as per the specifications of MoRTH clause 511.2.

2227.11 Mixed Seal Surfacing

This work shall consist of the preparation, laying and compaction of a close-graded premix surfacing material of 20 mm thickness composed of graded aggregates premixed with a bituminous binder on a previously prepared surface, in accordance with the requirements of these Specifications, to serve as a wearing course. Close graded premix surfacing shall be of Type A or Type B as specified in the Contract documents.

The materials to be used, construction operations, surface finish and quality checks and opening to traffic shall be as per the specifications of MoRTH clause 512.

2227.12 Mastic Asphalt

This work shall consist of constructing a single layer of mastic asphalt wearing course for road pavements and bridge decks. Mastic asphalt is an intimate homogeneous mixture of selected well graded aggregates, filler and bitumen in such proportions as to yield a plastic and void less mass, which when applied hot can be trowelled and floated to form a very dense impermeable surfacing. Its consistency is such that it flows like a viscous fluid at temperatures of around 175⁰ C to 210⁰ C but, on cooling to normal temperatures; it solidifies in to a dense mass. Thus its construction requires no compacting effort. Because of its superior properties, it is used as a wearing course material for heavy duty pavements, city streets carrying high volume of traffic, bus stops where heavy tangential forces are expected, junctions where cornering stresses are predominant.

The materials to be used, construction operations, surface finish and Quality checks and opening to traffic shall be as per the specifications of MoRTH clause 515.

2227.13. Seal Coat

This work shall consist of the application of a seal coat for sealing the voids in a bituminous surface laid to the specified levels, grade and cross fall (camber). Seal coat shall be of either of the two types specified below:

- Liquid seal coat comprising of an application of a layer of bituminous binder followed by a cover of stone chips.
- Premixed seal coat comprising of a thin application of fine aggregate premixed with bituminous binder.

The materials to be used, construction operations, surface finish and quality checks and opening to traffic shall be as per the specifications of MoRTH 513.

2227.14. Bituminous Cold Mix (Including Gravel Emulsion)

Bituminous Cold Mix consists of a mixture of unheated mineral aggregate and emulsified or cutback bitumen. This Specification deals only with plant mix (as opposed to mixed- in-place). Bituminous cold mixes are used in situations where hot mix plants are not readily available, including for work in remote areas and maintenance operations. Two types of mix are considered, namely,

- Designed Cold Mix
- Recipe Cold Mix.

The Design Mix procedure shall be used unless the Engineer specifically approves the Recipe Mix procedure.

The materials to be used, construction operations, surface finish and quality checks and opening to traffic shall be as per the specifications of MoRTH 519.

2228. Concrete Pavement

2228.1. Semi-rigid Pavement Construction

Semi- rigid pavements are a concrete sub base having a wearing course over it. In case of rural roads the wearing course have be a thin bituminous surface. Semi-rigid pavements are also used as a Sub base for making cement concrete pavement. Generally, the following types are used for Semi-rigid pavement construction.

- Dry Lean Cement Concrete. (DLC)
- Cement Fly Ash Bound Macadam
- Lime Fly Ash Concrete
- Lime Fly Ash Bound Macadam

However, Dry Lean Cement Concrete (DLC) is most commonly adopted.

2228.2. Lean Cement Concrete (DLC)

The work shall consist of construction of dry lean concrete sub base for cement concrete pavement in accordance with the requirements of the specifications and in conformity with the lines, grades and cross-sections shown on the drawings.

The materials to be used, construction operations, surface finish and quality checks and opening to traffic shall be as per the specifications of MoRTH 601.

2228.3. Rolled Cement concrete Base

The work shall consist of construction of rolled concrete base course for cement concrete pavement in accordance with the requirements of these specifications and in conformity with the lines, grades and cross sections shown on the drawings.

The materials to be used, construction operations, surface finish and quality checks and opening to traffic shall be as per the specifications of MoRTH 603.

2228.4. Cement Concrete Pavement

The work shall consist of construction of unreinforced, dowel jointed, plain cement concrete pavement in accordance with the requirements of the specifications and in conformity with the lines, grades and cross sections shown on the drawings.

The materials to be used, construction operations, surface finish and quality checks and opening to traffic shall be as per the specifications of MoRTH 602.

2229.Shallers

2229.1. General

Shaller gives adequate side support to the pavement and also drains off surface water from the carriageway to the roadside drain. The work shall consist of constructing shaller on either side of the pavement in accordance with the requirements of these Specifications and in conformity with the lines, grades and cross-sections shown on the drawings.

Shaller may be of selected earth/ granular material/ paved conforming to the requirements of MoRTH Clause 305/407. Paved shallers shall consist of sub-base, base and surfacing courses, as shown in the drawings and materials for the same shall conform to relevant Specifications of the corresponding items. Where paved or hard shallers are not provided, the pavement shall be provided with brick/stone block edgings as shown in the drawings. The bricks shall conform to Clause 1003 of these Specifications. Stone blocks shall conform to Clause 1004 of these Specifications and shall be of size 225 mm x 110 mm x 75 mm.

2229.2.Shoulder width

Width of the shoulder shall vary from 1 m to 2.5 m be as shown on the drawings or as directed by the Assistant Engineer.

2229.2.1Construction Method

The sequence of operations shall be such that the construction of paved shaller is done in layers each matching the thickness of adjoining pavement layer. Only after a layer of pavement and corresponding layers in paved and earth shaller portion have been laid and compacted, the construction of next layer of pavement and shaller shall be taken up.

Where the materials in adjacent layers are different, these shall be laid together and the pavement layer shall be compacted first. The corresponding layer in paved shaller portion shall be compacted thereafter, which shall be followed by compaction of earth shaller layer. The adjacent layers having same material shall be laid and compacted together.

During all stages of shaller (earthen/ hard/ paved) construction, the required cross fall shall be maintained to drain off surface water.

2229.3Culverts

Culverts are mainly of two types, Pipe Culverts and Slab Culverts. The width of culvert shall be equal to the formation width of the road. It shall be generally situated on the straight alignment of the road. If the road has a gradient the same shall be maintained for deck slab of the culvert.

2229.3.1Pipe Culverts:

2229.3.2NP 4 pipes for national highways conforming to IS 458:1988 shall be used.

Bedding: The bedding must be even and uniform, projecting rock faces and boulders must be removed before forming the bedding. The thickness of bedding layer shall be minimum 75 mm. The bedding material shall be well graded sand or granular material passing 75 mm sieve.

For heights of fill greater than 4 m, continuous concrete cradle bedding may be used. The mix shall not be leaner than M150 concrete and the pipes shall be laid in position before the concrete has set.

Laying: Start Laying from the outlet and proceed towards the inlet ensuring the specified lines and grade. The minimum longitudinal slope shall be 1 in 1000.

Where two or more lines of pipes are to be laid adjacent to each other, they shall be separated by a distance equal to at least half the diameter of the pipe subject to a minimum of 450 mm. Ensure that the pipe has a cushion of at least 0.60 m excluding crust thickness at the top.

Section 2900 of MoRTH specifications shall be referred for further details.

2229.3.2.RCC Slab Culverts:

Depending on the scour characteristics of the bed material, open foundations with or without erosion proof bed flooring is generally adopted. In general, concrete footing shall rest over good stratum at a depth of about 1.5m below the lowest bed level. Bed flooring where provided shall consist of stone pitching set in cement mortar 1:3 or two layers of brick on edge set in cement mortar 1:3. These shall be laid over 150 mm thick foundation concrete M15.

2229.3.3.RCC Box culverts

These are economical in such cases where either the depth of foundation is more than 4 m below bed level or where the total embankment is very high and are suitable for a situation where the catchment area is more than 40 hectares. Box section of height less than 2m X 2m is not practicable to implement.

2230.Dimensions of abutment and wing wall:

Dimensions of abutment for RCC Slab Culvert

Span	1m to 4 m			5m to 6 m		
	2	3	4	2	3	4
H	2	3	4	2	3	4
b1	0.2	0.3	0.4	0.2	0.3	0.4
b2	0.7	1.1	1.4	0.6	1	1.4
b3	0.3	0.3	0.3	0.4	0.4	0.4
b4	-	0.2	0.5	-	0.2	0.6
B1	1.5	2.0	2.4	1.5	2.0	2.5
B2	2.7	3.6	4.6	2.7	3.6	4.9

Dimensions of wing wall

Span	upto 2 m			3 m			4 m			5 m			6m		
	2	3	4	2	3	4	2	3	4	2	3	4	2	3	4
H	2	3	4	2	3	4	2	3	4	2	3	4	2	3	4
b1	0.23	0.33	0.43	0.24	0.34	0.44	0.24	0.34	0.44	0.25	0.35	0.45	0.25	0.35	0.45
b2	0.57	0.82	1.07	0.59	0.84	1.09	0.6	0.85	1.10	0.62	0.87	1.13	0.63	0.88	1.13
B1	1.3	1.65	2.0	1.33	1.68	2.03	1.34	1.69	2.04	1.37	1.72	2.08	1.38	1.72	2.08
B2	2.1	2.45	2.8	2.13	2.48	2.83	2.14	2.49	2.84	2.17	2.52	2.88	2.18	2.53	2.88

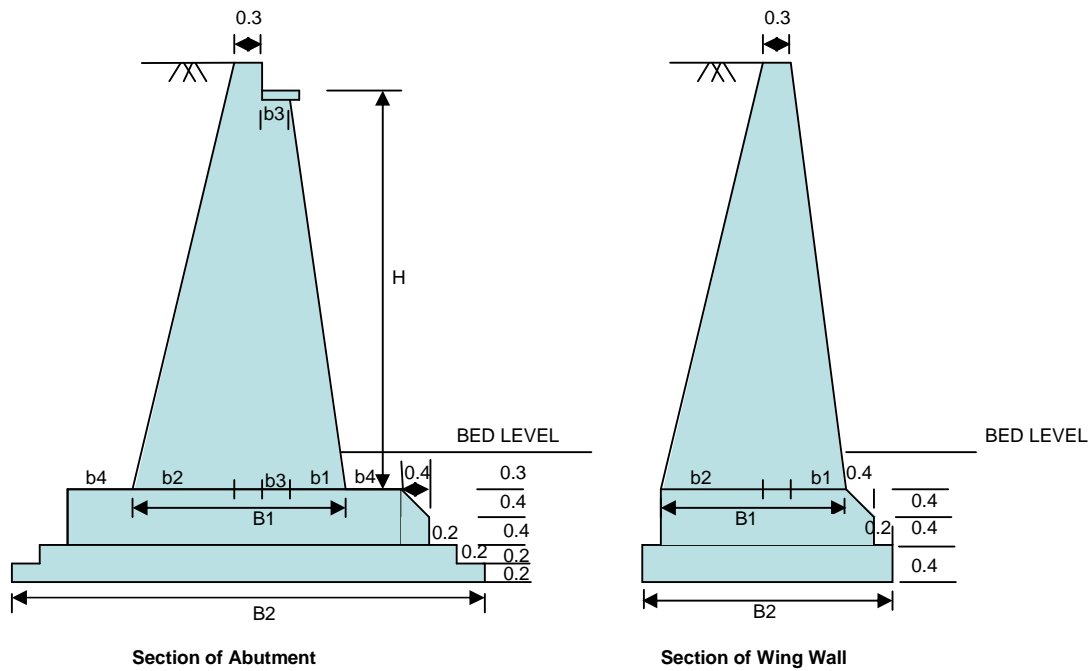


Figure 4.2 Abutment and wing wall section for height more than 4.5m

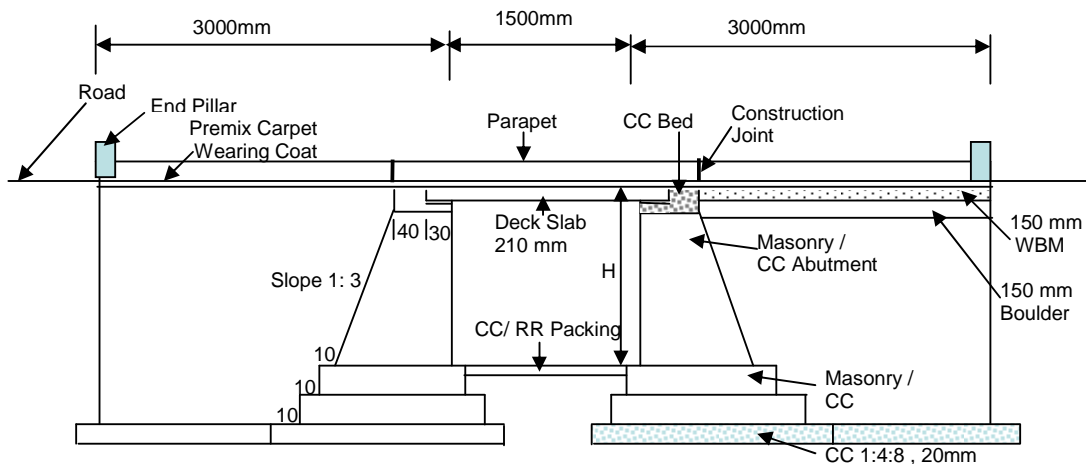


Figure 4.3 Typical Details of Abutment and wing wall section for height upto

The following points are to be followed for construction of culverts.

1. The design shall be based on 2lane IRC Class A loading.
2. The length of wing walls shall be sufficient to eliminate any tendency of the embankment slope to slip into the stream.
3. Construction joint between abutment and wing wall shall be provided to avoid overstressing at the junction due to differential settlement.
4. The bearing shall be of reinforced bitumen laminated Kraft paper conforming to IS 1938. While concreting the slabs, care shall be taken to prevent the bearing material from being displaced.
5. All space between foundation, masonry or concrete and the sides of excavation shall be refilled to the original surface in layers not exceeding 150 mm compacted thickness.
6. The backfill material around the structure shall be of granular type having plasticity index and liquid limit not exceeding 20 and 40 respectively. The fill material shall be deposited in horizontal layers not exceeding 200 mm compacted thickness.
7. If the height and abutment and return over bed level is more than 2 m weep hole shall be provided 150 mm above low water level or ground level whichever is higher. In case of concrete/ masonry,

weep holes of 150 mm dia or 80 X 150 mm size in 1:20 slope shall be provided at 1 metre interval both horizontally and vertically. Refer IRC 40

8. Water Spout shall be provided for large span culverts. For 5 and 6 m span, one water spout of 100 mm diameter shall be provided in the centre of slab on either side of the deck.
9. All culverts shall be numbered on the end pillars as per IRC SP 20 with year of construction.
10. In case of stone masonry, coarse rubble masonry is stipulated.
11. Face stones shall be hammer dressed on all beds and joints so as to give them approximately rectangular shapes.
12. The hearting or interior filling of the wall shall consist of flat bedded stone carefully laid on their proper beds in mortar. While the use of chips shall be restricted to the filling of interstices between the adjacent stones in hearting and these shall not exceed 15 % of the quantity of masonry.
13. Bond stones or headers shall be at 1.5 m or 1.8 m apart clears in every course. The headers shall overlap at least by 150 mm
14. Face stone shall tail into the work for not less than their heights and at least one third of the stones shall tail into the work for a length not less than twice the height.
15. The face joint shall not be more than 20 mm thick.

2231.Causeways and Submersible Bridges.

A causeway is a small submersible structure, which allows flood to pass over it.

2231.1.Flush causeway: It is a paved dip built to cross a shallow water course. The top level shall be at the same level as that of the bed of the water course.

2231.2. A low level or vented causeway: This is a structure provided with a few openings comprising of pipes, small span slabs or small arches etc. with a raised road top level to a moderate height upto 1.5 m height.

2231.3. A high-level causeway: This is a submersible structure provided with larger openings comprising of a simply supported /continuous RCC slab or multiple arches or boxes and a raised road top level to a reasonable height 1.5 m to 3 m. The RCC Slab may be supported over a series of short piers (Masonry/CC)

To avoid the heading up of water on the upstream side which results in producing high velocities leading to structural failure and out flanking, the top level of the causeway shall be kept as low as possible. The water way provided in the causeway shall not be less than 30 % of the area of the stream, measured between the stream bed level and the proposed top level of the road.

The details for culvert and causeway design shall be referred to in IRC SP 20-2002.

2232.Side drains

Side drain must be provided to collect surface water from the roadway and lead to an outlet. It also acts as an outlet for the subsurface drains thereby protecting the base course of the roadway structure from getting saturated/ lost its load bearing capacity. Side drains are designed for open channel flow and generally provided on both sides of the road. Road drains in hilly terrain are constructed to parabolic, trapezoidal, triangular, V-shaped, Kerb and channel or U- shaped cross sections.

IRC SP 20 and IRC 42 may be referred for details and design of drains.

2233. Geosynthetics

This specification covers the various applications of Geosynthetic materials in road and bridge works including supplying and laying as per special provisions.

Geosynthetics includes,

- (i) **Geotextile:** Any permeable textile natural or Synthetic, used with foundation, soil, rock, earth, or any other geotechnical engineering related material. In the present chapter, it is related to synthetic material only.
- (ii) **Geogrid:** A deformed or non-deformed grid of polymeric material used primarily for reinforcement purposes with foundation, soil, rock, earth, or any other geotechnical engineering related material.
- (iii) **Geonets :** These are net made of polymeric material used for drainage of foundation, soil, rock, earth or any other geotechnical engineering related material.

- (iv) **Geomembrane** : An essentially impermeable membrane of polymeric material used with foundation, soil, rock, earth or any other geotechnical engineering related material, to control fluid migration.-
- (v) **Geocomposite** : A manufactured material using geotextiles, geogrids, geonet and/ or geomembrane in laminated or composite form,"

The details on specifications, quality and laying of geosynthetics are given in Section 700 of MoRTH.

2234. Execution – Bridges

2234.1.General

Before starting the construction work, the procedure mentioned in section 2200 must be followed and care must be taken to ensure that the following documents are available at site.

1. Sanction letter and technical note, if any
2. Bill of Quantities
3. Copy of contract document
4. Copy of approved set of plans, estimates and detailed working drawings
5. Standards, specifications, guidelines, codes of practices etc., according to which the work must be executed as per contract
6. Survey, investigation and subsoil test reports

2235. Excavation

Before starting excavation, it is necessary that initial site levels are taken. Protective works, if any, shall be completed before monsoon so that foundations do not get undermined. Excavations for laying foundations shall be carried out in accordance with Section 300 of MoRTH Specification for Road and Bridge works. The last 300 mm of excavation shall be done just before laying of lean concrete below foundation.

Where there is any doubt regarding the bearing capacity or suitability of the foundation soil the matter shall be reported to the Executive Engineer. In the case of small works up to TS power of Executive Engineer, if any variation on the width, depth and type of foundation is found necessary the Assistant Executive Engineer himself may decide the matter after reporting to the authority sanctioning the estimate.

Load tests shall be conducted in the foundation soil if found necessary. If the contractor has over excavated the foundation, he shall not be allowed to refill this with earth but, the additional excavation shall be filled up by concrete. No extra cost is payable to the contractor on this account. In some cases, it may be possible to reduce the depth or width of foundation due to existence of harder type of soil or rock in particular localities but the Assistant Executive Engineer may decide on the alteration necessary and instruct the contractor accordingly. A report shall be sent to the Executive Engineer clearly indicating the change effected and the reasons therefore.

The useful materials obtained from excavation like moorum sand stone etc. shall be stacked separately and properly measured and accounted for. It shall be reused for backfilling of foundations and other useful works. All spaces excavated and not occupied by the foundation shall be refilled upto surrounding level in accordance with section 300 MoRTH Specification for Road and Bridge works. All safety measures shall be observed at site to avoid accidents. Unauthorized entries to site of work shall be prohibited. The contractor shall obtain proper license for explosives whenever these are to be stored.

The excavation for foundation shall be checked and got approved by the Executive Engineer

2236. Concreting

All the materials used in concreting must be tested for relative properties before hand.

2236.1. Key Points

- The minimum cement content is based on 20 mm aggregate.
- For 40 mm and larger sized aggregates, cement content may be reduced suitably, but the reduction shall not be more than 10%
- For underwater concreting, the cement content shall be increased by 10 %.
- Prior to start of construction, the contractor shall design the mix and submit to the Executive Engineer for approval of the mix, proportions of materials, including admixtures used.
- Trial mixes: Test cubes shall be taken, from trial mixes. For each mix, set of six cubes shall be made from each of three consecutive batches. Three cubes from each set of mix shall be tested at

an age of 28 days and three at an earlier date (7 days) approved by the Executive Engineer. The cubes shall be made, cured, stored, transported and tested in conformity with the MoRTH specifications.

- The average strength of the nine cubes at 28 days shall exceed the specified characteristic strength.
- Concrete shall be mixed either in a concrete mixer or in a batching and mixing plant approved by the Executive Engineer. Hand mixing shall not be permitted.
- Mixers, which have been out of use for more than 30 minutes, shall be thoroughly cleaned before putting in a new batch.
- The first batch of concrete from the mixer shall contain only two thirds of the normal quantity of coarse aggregate.
- The compacted thickness of each layer shall not be more than 0.45 m when internal vibrators are used and shall not exceed 0.3 m in all other cases.
- Do not allow dropping of concrete from a height exceeding 2 m.
- When concreting is to be received on a surface, which has hardened, it shall be roughened, swept clean, wetted and covered with a 13 mm thick mortar layer composed of cement and sand in the same ratio as in the concrete mix.
- Do not apply vibration through the reinforcement.
- Keep the compacted concrete continuously wet for a period not less than 14 days

Transporting, placing and compaction of Concrete shall be as per clause 1709 of MoRTH Specification for Road and Bridge works. For formwork and staging clause 1500 of MoRTH Specification for Road and Bridge works shall be followed. The contractor shall furnish the design and drawings of complete formwork as well as their supports for approval of the Assistant Executive engineer before any erection is taken up. Metal/ laminated board formwork shall preferably be used for achieving good finish. The formwork shall be robust and strong and the joints shall be leak proof. The formwork shall be coated with an approved release agent that will effectively prevent sticking and will not stain the concrete sides. The formwork shall be inspected and approved by Assistant Executive Engineer before concreting is done.

The requisite properties for structural steel shall be as per clause 1009 of MoRTH Specification for Road and Bridge works and its placement shall conform to clause 1600 of MoRTH Specification for Road and Bridge works. This includes protection of reinforcement, bar splicing and bending of reinforcement. The size (Maximum nominal) of coarse aggregates for concrete to be used shall be as given in Table 123.4

Table 123.4 Maximum nominal size of Coarse aggregates

Sl no:	Components	Maximum nominal size of Coarse aggregates
1	RCC Well kerb	20
2	RCC/ PCC Well steining	40
3	Well cap or pile cap, solid type piers and abutment	20
4	RCC work in Girders, slabs, wearing coat, curb approach slab, hollow piers and abutments, piers.	20
5	Pre stressed concrete (PSC) work	20
6	Any other item.	As specified by the Executive Engineer

The time of removal of formwork and staging shall be as per Table 4.3.2.

Table 4.3.2 Time of Removal of Formwork

a)	Walls, piers, abutments, columns and vertical faces of structural members	12 – 48 hours as may be decided by the Assistant Executive Engineer
b)	Soffits of slab (with props left under)	3 days
c)	Props (Left under Slabs)	14 days
d)	Soffits of Girders (With props left under)	7 days
e)	Props (left under Girders)	21 days

2237. Foundations

2237.1. Open foundation:

The plan dimensions of the foundation shall be set out at the bottom of foundation trench and checked with respect to original reference line and axis. It shall be ensured that at no point the bearing surface is higher than the founding level shown on the drawing.

Open foundation shall be constructed in dry conditions and the contractor shall provide for adequate dewatering arrangements to the satisfaction of the Assistant Executive Engineer. Measures such as bailing out, pumping, constructing diversion channels etc. shall be taken to keep the foundation trenches dry and to protect the green concrete against damage. Where the bearing surface is earth, a layer of M15 concrete shall be provided below foundation concrete. The thickness of lean concrete layer shall be 100 mm minimum unless otherwise specified. All spaces excavated and not occupied by the foundation shall be refilled and compacted with earth up to the surface of surrounding ground. In case of excavation in rock, the annular space around foundation shall be filled with M 15 concrete up to the top of rock.

The construction procedure shall conform to provisions contained in Section 2100 of MoRTH Specification for Road and Bridge works.

2237.2. Well foundation:

This work consists of construction of well foundation, taking it down to the founding level through all kinds of sub-strata, plugging the bottom, filling the inside of the well, plugging the top and providing a well cap in accordance with the details shown on the drawing and as per the specifications of MoRTH Specification for Road and Bridge works section 1200.

Key points:

- Fix up reference points, away from the zone of blowups/ settlements resulting from well sinking and mark centre lines of the individual wells in longitudinal and transverse directions accurately.
- Benchmark and reference points shall be checked regularly from permanent points fixed at site.
- Cutting edge shall be laid on dry ground / Sand Island.
- Sand Island to be protected against scour until the sinking is done to a safe level.
- Floating caisson of steel can be adopted when construction of Sand Island is not feasible.
- Use steel formwork for well curb
- Concreting in the well curb shall be done in one continuous operation.
- Steining shall be cast only after sinking the curb to some extent so that it becomes stable.
- The steining shall be built in one straight line from bottom to top.
- The height of the steining shall be calibrated by marking on outer faces in longitudinal and transverse directions (4 sides) with every metre mark in paint. Zero shall start from bottom of the cutting edge.
- For sinking, material be excavated uniformly all round the dredge hole
- De-watering shall not be permitted as a means for sinking.
- A detailed statement with regard to the progress of well sinking shall be maintained at site as per Appendix 2200 F.
- If a tilt occurs, further steining has to be carried out, with the axis of the extended steining following the axis of the well already sunk. Tilts shall be corrected as soon as it occurs.
- Sinking history of well including tilt and shift, kentledge, dewatering, blasting done during sinking shall be maintained in the format given in Appendix-2200 G
- The depth of sump below the level of cutting edge shall be generally limited to one-sixth of the outer diameter/ least lateral dimensions of well in place. Normally, the depth of sump shall not exceed 3m unless otherwise specifically permitted by the Engineer.
- Bottom plugging shall be done with the help of tremie pipe. Additional 10 per cent cement shall be provided in the concrete for bottom plug.
- A record of the method of sinking adopted, bottlenecks encountered etc. may be kept as per proforma given in Appendix-2800 H

2237.3. Pile Foundation

Sub-surface investigation shall be carried out by in-situ pile tests. At least one bore- hole for every foundation of the bridge shall be executed. Depth of boring shall not be less than

- 1.5 times estimated length of pile in soil but not less than 15 m beyond the probable length of pile
- 15 times diameter of pile in weak/jointed rock but minimum 15 m in such rock

- 4 times diameter of pile in sound, hard rock but minimum 3 m in such rock

2237.3.1. Type of piles

The piles may be of reinforced concrete, pre stressed concrete, steel or timber. The piles may be of solid or hollow sections or steel cased piles filled with concrete. Concrete piles may be driven cast-in-situ or pre-cast or bored cast- in-situ or pre-cast piles driven into preformed bores. The shape of piles may be circular, square, hexagonal, octagonal, "H" or "I" Section.

Construction of pile foundations shall be as per the MoRTH Specification for Road and Bridge works clause 1100 and IS: 2911. The construction of pile foundations requires a careful choice of the piling system depending upon sub-soil conditions and loading characteristics and type of structure. The method of installing the piles, including details of the equipment shall be submitted by the Contractor and got approved by the Executive Engineer

2237.3.1.1. Key points:

(i) Test piles

- Test piles that are to become a part of the completed structure shall be installed with the same type of equipment that is proposed to be used for piling in the actual structure.
- Test piles, which, are not to be incorporated in the completed structure, shall be removed to at least 600 mm below the proposed soffit level of pile cap and the remaining hole shall be backfilled with earth or other suitable material.

(ii) Pre-cast concrete piles

- For pre cast piles, concrete shall be placed continuously until the completion of each pile, the length of pile shall not normally exceed 25 metres.
- Pre-cast concrete piles shall be lifted by means of a suitable bridle or sling attached to the pile but normally at points not more than 3 metres from the ends of the piles
- Pre-cast concrete piles cured with water shall not be driven for at least 28 days after casting (10 days with rapid hardening cement)

Detailed procedure for construction and driving of pre-cast pile are given in the MoRTH Specification for Road and Bridge works clause 1106

(iii) Cast-in-situ concrete piles

- Cast-in-situ concrete piles may be either installed by making a bore into the ground by removal of material or by driving a metal casing with a shoe at the tip and displacing the material laterally.
- Cast- in-situ concrete piles may be cast in metal shells, which may remain permanently in place.
- The reinforcement cages must be prepared in advance and adjustment to the length done depending on site requirements.
- This cage shall be lowered just prior to concreting and completed without interruption.
- In case of liners being withdrawn, sufficient head of concrete has to be provided to prevent the entry of ground water or reduction of cross section (necking of the pile).
- A minimum of 2.0 m length of top of bore shall invariably be provided with casing to ensure against loose soil falling into the bore.
- If the concrete is placed inside pre-cast concrete tubes or consists of pre-cast sections, these shall be free from cracks or other damage before being installed.

Specific requirements of cast- in-situ driven piles shall be as per Clauses 1100 of MoRTH Specification for Road and Bridge works.

The equipments used for pile driving and the detailed procedures shall be as per Clauses 1110 & 1111 of MoRTH Specification for Road and Bridge works.

2238 Sub Structure

The construction procedure shall conform to provisions contained in Section 2200 of MoRTH Specifications for Road and Bridge Works.

2238.1. Piers and Abutments

- In case of concrete piers, the number of horizontal construction joints shall be kept minimum.
- Construction joints shall be avoided in splash zones.
- No vertical construction joint shall be provided.
- In case of tall piers and abutments, use of slip form shall be preferred.

- The surface of foundation/well cap/pile cap shall be scrapped with wire brush and all loose materials removed.
- In case reinforcing bars projecting from foundations are coated with cement slurry, tapping, hammering or wire brushing shall remove the same.
- Before commencing masonry or concrete work, the surface shall be thoroughly wetted.
- In case of solid (non-spill through type) abutments, weep holes as shown on the drawings shall be provided.
- The surface finish shall be smooth, except the earth face of abutments, which shall be rough, finished.
- In case of abutments likely to experience considerable movement on account of backfill of approaches and settlement of foundations, the construction of the abutment shall be followed by filling up of embankment in layers to, the full height to allow for the anticipated movement during construction period before casting of superstructure.

Specific requirements of piers and abutments shall be as per Clauses 2204 of MoRTH Specification for Road and Bridge works.

2238.1.1. Pier Cap and Abutment Cap

- The locations and levels of pier cap/abutment cap/pedestals and bolts for fixing bearings shall be checked carefully to ensure alignment in accordance with the drawings of the bridge.
- The surface of cap shall be finished smooth and shall have a slope for draining of water as shown on the drawings.
- For short span slab bridges with continuous support on pier caps, the surface shall be cast horizontal.
- The top surface of the pedestal on which bearings are to be placed shall also be cast horizontal.
- The surface on which elastomeric bearings are to be placed shall be wood float finished to a level plane which shall not vary more than 1.5 mm from straight edge placed in any direction across the area.
- The surface on which other bearings (steel bearings, pot bearings) are to be placed shall be cast about 25 mm below the bottom level of bearings and as indicated on the drawings.

Specific requirements of Pier Cap and Abutment Cap shall be as per Clauses 2205 of MoRTH Specification for Road and Bridge works.

2238.2. Dirt/ Ballast Wall, Return Wall and Wing Wall

- In case of cantilever return walls, no construction joint shall generally be permitted.
- Wherever feasible, the concreting in cantilever return walls shall be carried out in continuation of the ballast wall.
- For gravity type masonry and concrete return and wing wall, the surface of foundation shall be prepared in the same manner as prescribed for construction of abutment. No horizontal construction joint shall be provided.
- If shown on drawing or directed by the Assistant Executive Engineer, vertical construction joint may be provided.
- Vertical expansion gap of 20 mm shall be provided in return wall/wing wall at every 10 metre intervals or as directed by the Assistant Executive Engineer.
- Weep holes shall be provided as prescribed for abutments or as shown on the drawings.
- The finish of the surface on the earth side shall be rough while the front face shall be smooth finished.
- Architectural coping for wing wall/return wall in brick masonry shall conform to section 1300 of MoRTH Specifications.

Specific requirements of Dirt/ Ballast Wall, Return Wall and Wing Wall shall be as per Clause 2206 of MoRTH Specification for Road and Bridge works.

2239. Bearings

Bearings are the part of the bridge structures, which bears directly all the forces from the structure above and transmits the same to the supporting structure. The different types of bearings currently in use are Steel bearings, Elastomeric Bearings, Pot Bearings and Special bearings. Bearings shall conform to the provisions contained under section 2000 of MoRTH Specifications for Road and Bridge Works.

2240. Super Structure

2240.1. Reinforced Concrete Construction

Construction of Solid Slabs and RCC T-Beam & Slab are carried out as per the clause 2300 set forth in MoRTH Specification.

2240.2. Pre-stressed Concrete Construction

Construction of PSC Girder and Composite RCC Slab, Box Girder and Cantilever shall be carried out as per the clause 2305 set forth in MoRTH Specifications

2241. Expansion Joint

Expansion Joints shall be provided as per Section 2600 of MoRTH specification for Road and Bridge Works.

2242. Wearing Coat and Appurtenances

2242.1. Wearing Coat

A wearing coat over the deck slab with bituminous material or Cement concrete shall be provided as per Clause 2702 of MoRTH Specifications.

2242.2. Approach Slab

Reinforced concrete approach slab covering the entire width of the roadway shall be provided as per details given on the drawings or as approved by the Assistant Executive Engineer. Minimum length of approach slab shall be 3.5 m and minimum thickness 300 mm. The base for the approach slab shall be as shown on the drawings.

2242.3. Drainage Spouts and Weep Holes

Drainage spouts and Weep holes shall be provided as per the clauses 2705 and 2706 of MoRTH respectively.

2242.4. Illumination

Provision for lighting arrangements shall be done as per the drawings.

2242.5. Railings

Bridge railing includes the portion of the structure erected on and above the kerb for the protection of pedestrians and traffic. Railings can be of Metal, Cast in situ and Pre-cast concrete. These shall be erected as per the Clause 2703 of MoRTH Specification. Railings or closely spaced guard stones shall be extended to the approach slabs.

2243. River Training and Protection Works

River training and protection work shall include construction of Guide bunds, Aprons, Stone pitching or Revetment on Slopes, Flooring, Curtain wall and Flexible Aprons as required for ensuring safety of the bridge structure and its approaches against damage by flood/flowing water. Constructions of the above components shall be carried out as per section 2500 of MoRTH Specifications.

2243.1. Brick and Stone Masonry

Where the design suggests the use of Brick or Stone masonry, these shall conform to the specifications in section 1300 and 1400 of MoRTH respectively.

2244. Quality Control

The quality control of Bridge construction shall conform to the section 2500 of this section

2245. Execution – Buildings

2245.1. General

Before start of the construction work, care must be taken to ensure that the documents as specified in section 2200 are readily available. The site shall be handed over to the contractor within the stipulated time and acknowledgement in prescribed form forwarded to all concerned officials.

2245.1.1. Professional Services and Responsibilities

The responsibility and competence of the team of professionals with regard to planning designing and supervision of building construction work shall be in accordance with Part 2 'Administration' of National Building Code 2005. The provisions in Part 2 'Administration' of National Building Code 2005 shall also govern all applications for permits and issuance of certificates, etc. Employment of trained workers shall be encouraged for building construction activity.

2245.1.2. Storage, Stacking and Handling of Building Materials

Storage, Stacking and Handling of Building Materials shall be in accordance with the Part 7 section 2 of National Building Code.

2245.1.3. Safety in Construction of a Building

The provisions of this Section shall apply to the erection/alteration of the various parts of a building or similar structure. In case of a doubt or dispute, the specific Rules, Regulations and Acts pertaining to the protection of the public or workmen from health and other hazards wherever specified by the Local/State Authority or in the Acts of the Government take precedence over whatever is herein specified. The safety management of the building site shall be in accordance with Part 7 Section 3 of National Building Code 2005.

2246. Construction Activities Undertaken from Foundation to Roof:

- i) The Contractor shall mark the Layout of Building on the ground in the form of centre lines of walls and columns. These centre lines shall be guided by brick pillars made along the centre line at a distance of 1.2 m from the outer walls and columns with the centre marked on these reference pillars with fresh plaster. Excavation is done to the prescribed basement floor level.
- ii) Balance excavation to be done after remarking the position of columns on excavated ground and also making temporary markings of centre lines on excavated sides. Marking the foundation/ beams sizes and then doing the balance excavation giving shape to the raft foundation / column foundations as per the design.
- iii) In case external waterproofing is to be done, it is to be done on the PCC and if internal it shall be done after completing the RCC of the basement. Then the final Layout of walls, columns and beams on the PCC shall be made and got verified by the Assistant Executive Engineer.
- iv) Contractor shall prepare and submit the bar bending schedule as per drawings and get it approved by the Assistant Executive Engineer. Cover blocks to be made by contractor in PCC at the time of laying PCC in the thicknesses stipulated and placed below or around reinforcement so as to provide proper cover. After laying of the Steel reinforcement it is to be checked and measured by the Assistant Executive Engineer for accuracy and cover to reinforcement. This shall be check measured by AEE
- v) Concrete for columns (or in walls) shall be as per design mix and vibrated properly. Cement additives can be added for generating proper flow and compaction of concrete as per clause 5.5 of IS 456: 2000. Single lift shall not be more than 1.2 m
- vi) Contractor is to cast the balance height of column after proper shuttering up to beam bottom.
- vii) Contractor is to provide and do shuttering of the roof as per structural drawings and check its level. It shall be ensured that proper amount of supports are provided and also that the shuttering is not uneven or done with very old planks or bent plates. The shuttering of wareproof ply or of steel sections made to the size required shall be used. Steel shuttering of various column sizes and also steel plates for roof shuttering shall be used. Assistant Engineer shall check the shuttering for levels and design aspect he shall also check the supports for any loose ends.
- viii) The primary responsibility of ensuring the correctness of the reinforcement details as per design is vested with the Assistant Engineer. But the contractor's Engineer shall certify that the reinforcement is provided as per structural drawings and bar bending schedule. The Overseer in charge shall report the matter to the Assistant Engineer.

- ix) In normal course concreting shall be done at a stretch. In the case of emergency the work shall be stopped only at supports or at the point of contra flexure.
- x) Time shall be given to the electrical contractor and the plumbing contractor for laying the pipes, fan and light boxes properly. Thus a gap of one day shall be provided after the bending of steel reinforcement so that both the electrical and sanitary contractors can execute this work properly and also for the Assistant Executive Engineer to check the reinforcement, shuttering, electrical and sanitary work.
- xi) Assistant Engineer shall depute one of his Overseers to keep a check at the point of mixing for volumes of cement, coarse sand, coarse aggregate. Additives for concrete available in the market for increasing the workability of concrete shall be used as per requirement.

2246.1. Site layout

The layout of the construction site shall be carefully planned keeping in view the various requirements to construction activities and the specific constraints in terms of its size, shape, topography, traffic and other restrictions, in public interest. A well-planned site layout would enable safe smooth and efficient construction operations. The site layout shall take into considerations the following factors:

- a) Easy entry and exit, with proper parking of vehicle and equipments during construction.
- b) Properly located material stores for easy handling and storage.
- c) Adequate stack areas for bulk construction materials.
- d) Optimum location of plants and equipments (batching plants, etc).
- e) Layout of temporary services (water, power, power generation unit, hoists, cranes, elevators, etc).
- f) Adequate yard lighting and lighting for night shifts.
- g) Temporary buildings; site office and shelter for workforce with use of non-combustible materials as far as possible including emergency medical aids.
- h) Roads for vehicular movement with effective drainage plan.
- i) Construction safety with emergency access and evacuations and security measures.
- j) Fabrication yards for reinforcement assembly, concrete pre-casting and shuttering
- k) Fencing, barricades and signage's.

2246.2. Buildings Materials

For all Building materials, methods of use and specifications National Building Code 2005, part V- may be followed

2247. Earthwork Excavation

Excavation wherever required shall be done to the prescribed building plan as per the clause 11, 12 and 13 of Section 3 Part 7 National Building Code 2005.

2248. Foundation

Foundation shall be done as per the design drawings. The forms and materials of building foundations vary according to ground conditions, structural material, structural type, and other factors. Types of foundation and details shall be referred to in Part VI Section 2 of National Building Code 2005 (Clause 6 to 13)

2249. Plain Cement Concrete.

Plain Cement Concrete shall be done as per the thickness given in the drawing. The minimum thickness of PCC must be 100 mm. The bottom of the foundation shall be leveled both longitudinally and transversely or stepped as directed by the Assistant Engineer. Before footing is laid, the surface shall be slightly watered and rammed. In the event of excavation having been made deeper than that shown on the drawings or as otherwise ordered by the Assistant Engineer, the extra depth shall be made up with concrete of same grade as that of PCC of the foundation at the cost of the Contractor. Earth filling shall not be used for the purpose to bring the foundation to level. When rock or other hard strata is encountered, it shall be freed of all soft and loose material, cleaned and cut to a firm surface either level and stepped as directed by the Assistant Engineer. In the case of open foundation dewatering shall not be permitted from the time of placing of concrete up to 24 hours after placement.

2250. Random Rubble Masonry for foundation and Basement:

In this type rubble stones are carefully laid, hammered down in to position and solidly embedded in mortar, with mortar joints not exceeding 12.5 mm in thickness. The stones will be hammer dressed on the face and stones are so arranged as to break joint as much as possible and long vertical lines of joints

are avoided. The mortar used in the rubble foundation shall be minimum 1:6 proportion. Bond stones must be used at staggered spacing of 1.5 m. The stones must be wetted before using.

2250.1 Damp proof course

Damp proof courses are inserted in horizontal beds in masonry. In basements vertical damp-proof courses also are provided. Usually the damp proof course consists of a layer of cement mortar or cement concrete 25 mm to 40 mm. thick painted over with 2 coats of bitumen - 1st coat at 1.2 Kg./sq. meter and 2nd coat at 0.7 Kg. per sq. meter. This is covered with coarse sand @ 0.006 cum per sq. meter.

Another method of damp proofing consists of adding certain compounds to concrete or mortar, like chalk, talc etc. which have a mechanical action of pore filling or alkaline silicates, aluminum or zinc sulphates, calcium, aluminum or ammonium chloride, iron fillings etc. which react chemically and fill the pores.

A third method of damp proofing consists of incorporation of a layer of water-repellent material such as lead sheet, slates, mastic asphalt etc. between the source of moisture and part of the building adjacent to it. Alternately one of the specifications as per part 5 of National Building code shall be followed.

2250.1.1. Damp-proof course above ground level

To prevent moisture rising above ground level by capillary action, the damp proof course is provided above ground level. To form an effective barrier, the course shall extend to the full thickness of masonry. Damp proof course when provided below flooring shall form a continuous layer with the damp-proof course in the masonry.

2250.1.2. Damp proof course for basement

This work shall be taken on hand only when the sub-soil water level is at its lowest. Further the site has to be kept dry by pumping till the work is completed and has set completely. Suitable structural support shall be provided for the damp - proof course to withstand the anticipated water pressure.

The following methods can be adopted:

- a. A base slab of weak cement concrete with a smooth surface finish is constructed on the floor of the excavation. This shall project at least 15 cm. beyond the outer walls. The damp proof course is laid over the entire slab.
- b. A protective flooring of flat brick or cement concrete 1:3:6 is constructed over the damp proofing course to protect it. The structural walls and floor are then constructed. They shall be suitably designed to withstand the anticipated water pressure. The outside faces are plastered and finished smooth.
- c. The damp proof course is then applied to the outside face of the wall, joining at the base to the projecting damp proof course originally laid over the base slab, taking care to ensure a perfect bond. A thin protective brick wall, half brick thick, is then constructed over the projecting base slab. The gap between the walls shall be grouted with cement.

Alternately, where sufficient working space is not available after the base concrete is laid, the outer protective wall is first constructed. The damp proof course is then laid over the floor and sides. A protective layer of brick is laid over the floor and a thin inner protective wall is constructed to protect the damp proof course laid over the sides. The structural walls are then constructed.

2250.2. Plinth beam

If the foundation is deep, that is, going more than half a storey in depth below the plinth, the Plinth shall be connected using beams. Plinth level shall be checked with respect to drawing level. Bottom of the peripheral plinth beam shall be kept 15cm below the existing ground level. Plinth beam shall be provided as per structural drawing.

2251. Cement Mortar

Cement and sand shall be mixed intimately in a mechanical mixer in the specified proportions. Proportioning of cement shall be weighed while sand can be by volumes, after making due allowance for bulking. The mortar shall be used within 30 minutes of addition of water.

2252. Brick work for structures

Bricks are to be immersed in water for a minimum period of one hour before use. All brickwork shall be laid in English bond, even and true to line, plumb and level. Bricks shall be laid with frogs up, on a full bed of mortar. All joints shall be properly flushed and packed with mortar so that no hollow space is

left. Thickness of joints shall not exceed 10mm. The masonry shall be kept constantly moist on all faces for a minimum period of 7 days.

2253. Formwork

Most structural concrete is made by placing (also called CASTING) plastic concrete into spaces enclosed by previously constructed Forms. These forms are usually removed once the plastic concrete hardens into the shape outlined by the forms. Forms for concrete structures must be tight, rigid, and strong. The forms must be strong enough to resist the high pressure exerted by the concrete.

2253.1. Form Materials

Wood, plywood, steel, fiberglass, and other approved materials are commonly used as form materials.

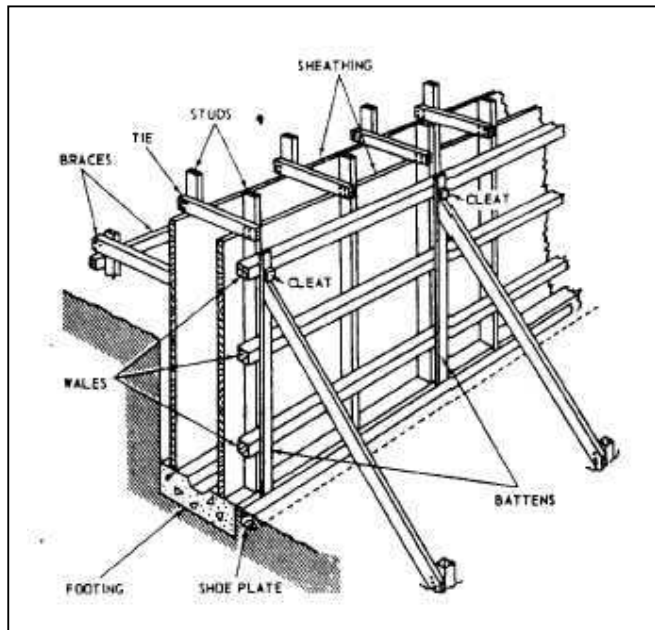
2253.1.1. Foundation Forms

Foundation forms may include forms or parts of forms for column footings, pier footings, and wall footings. Whenever possible, the earth shall be excavated and the hole used to contain the foundation of footing forms. Footings are cast directly against the earth, and only the sides are molded in forms. Where there is a firm natural earth surface, which is capable of supporting and molding the concrete, there is no need of additional formwork.

Wall forms are made up of five basic parts. They are as follows:

- (1) Sheathing, to shape and retain the concrete until it sets;
- (2) Studs, to form a framework and support the sheathing;
- (3) Wales, to keep the form aligned and support the studs;
- (4) Braces, to hold the forms erect under lateral pressure; and
- (5) Ties and spreaders or tie-spreader units, to hold the sides of the forms at the correct spacing.

Wall forms may be built in place or prefabricated, depending on the shape and the desirability for reuse. Wall forms are usually reinforced against displacement by the use of TIES. Small surface holes remain, which can be plugged with grout. The prefabricated panels for formwork can be used. The panels can be sized to suit any particular situation. Projects requiring mass



concrete are often formed by the use of giant panels or ganged, prefabricated forms. Cranes usually raise and place these large sections, so only the available equipment limits their size. These large forms are built or assembled on the ground, and their only basic difference from regular forms is the extra bracing required withstanding handling. Special attention must be given to corners when forms are being erected. These are weak points because the continuity of sheathing and wales is broken. Forms must be pulled tightly together at these points to prevent leakage of concrete.

2253.2. Column Forms

A typical concrete column form is securely braced to hold the sheathing together against the bursting pressure exerted on the form by the plastic concrete. Since the bursting pressure is greater at the bottom than the top, the bracings are placed closer together at the bottom. Boltholes are bored in projections, and bolts are inserted to backup the wedges that are driven to tighten.

2253.3. Beam and Girder Forms

The type of construction to be used for beam forms depends upon whether the form is to be removed in one piece or whether the sides are to be stripped and the bottom left in place until such time as the concrete has developed enough strength to permit removal of the shoring. Beam forms are subjected to very little bursting pressure but must be shored up at frequent intervals to prevent sagging

under the weight of the fresh concrete. The vertical side members are placed to assist in transmitting slab loads to the supporting shores.

2253.4. Scaffoldings

Properly designed and constructed scaffolding built by competent workmen shall be provided during the construction in the building site to ensure the safety of workers. Joining the members of scaffolds only with nails shall be prohibited, as they are likely to get loose under normal weathering conditions. In the erection or maintenance of tall buildings, scaffoldings shall be of noncombustible material especially when the work is being done on any building in occupation. Frequent inspections of scaffolding shall be done after initial construction of the scaffolding.

2254. Column

Concrete columns shall be executed as per approved structural drawings/ designs. For any change proposed at site, in the size of column section and reinforcement/or their orientation, etc., approval of Executive Engineer shall be obtained before execution.

2255. Walls

Walls are differentiated into two types: load bearing and non-load bearing. Load-bearing walls not only separate spaces, but also provide structural support for whatever is above them. Non-load bearing walls function solely as partitions between spaces. Partition walls, curtain wall, panel wall and shear wall come under this category.

Common burnt clay bricks, Burnt clay fly ash bricks, pulverized fuel ash lime bricks, Stones, Sand lime bricks, Concrete blocks (Solid & Hollow), Lime based blocks, Burnt clay hollow blocks, Gypsum Partition blocks, Autoclaved cellular concrete blocks and Concrete stone masonry blocks are used with cement mortar for the construction. The materials used in masonry construction shall be in accordance with the Part 5 Building Materials and construction shall conform to the accepted standards of Part 6 Section 4 Masonry of NBC. Height and length of masonry walls shall be restricted as per clause 4.6 and clause 8 of Section 4 of part 6 of National Building Code.

Depending on the type of wall to be constructed height of the wall per day shall be restricted to ensure that the newly constructed wall does not come down due to lack of strength in lower layers. In long walls adequate expansion/crumple joints shall be provided to ensure safety. If an opening is necessary in the existing wall then adequate support against the collapse or cracking of the wall portion above or roof or adjoining walls shall be provided. Whenever projections cantilever out of the walls temporary form work shall be provided for such projections and the same shall not be removed till wall over the projecting slabs providing stability load against over turning are completely constructed.

2256. Lintel, Bond Beams, and Sills

Bond beams are reinforced courses of block that bond and integrate a concrete masonry wall into a stronger unit. They increase the bending strength of the wall and are particularly needed to resist the high winds of hurricanes and earthquake forces. In addition, they exert restraint against wall movement, reducing the formation of cracks. Bond beams are constructed with special-shape masonry units (beam and lintel block) filled with concrete or grout and reinforced with embedded steel bars. These beams are usually located at the top of walls to stiffen them. Since bond beams have appreciable structural strength, they can be located to serve as lintels over doors and windows. Lintels shall have a minimum bearing at each end equal to depth or 15cms whichever is higher. Pre-cast concrete lintels can be used with an offset on the underside to suit the modular openings. Pre-cast concrete sills can be used.

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57.1. Sunshade: This is provided for protection of doors windows, ventilators and other openings from the effect of rain and sunlight. This may be provided as per the provisions of the code IS 456. It must be cast monolithically with the lintel and care must be given to ensure sufficient slope to aid runoff. Lintel must be raised above the sunshade to a minimum 5 cm so that water seepage is avoided.

2257. Beam

Beams are the principal load-carrying horizontal members. They take the load directly from the floor above and carry it to the columns. The beams shall be constructed in accordance with the structural drawings.

2258. Slabs

Slabs shall be constructed as per the structural drawings. Top surface of Roof slab shall have necessary slope to drain off rainwater. In case of sloping roof, the slabs shall rest on RCC beams over masonry walls, so that crack development can be avoided.

2259. Pre-stressed concrete

For this method of concreting Refer IS 1343: 1980

2260. Ready mixed concrete

For this method of concreting Refer IS 4926: 2003

2261. Doors

Wood, Metal and Plastic are used for fabrication of doors, windows and ventilators. All wood components are treated with a water-repellent preservative to provide protection against moisture. Doors in the traditional pattern are usually of the panel type. Flush doors consist of thin plywood faces over a framework of wood with a wood block or particleboard core. Exterior doors are usually 4cms thick and not less than 2mts high. The main entrance door is of minimum 100cms width, and the side or rear door is normally 90cms wide. Novelty doors, such as PVC door unit, are commonly used for water closets/bath rooms because they provide water resistance. Hinged doors shall open or swing in the direction of natural entry, against a blank wall, and shall not be obstructed by other swinging doors. Doors shall never be hinged to swing into a hallway. If there is no sufficient space for swing doors, sliding doors shall be provided. For the general requirements of the door refer Part 3 Clause D-3.3 of the NBC.

2261.1.Windows

Windows shall be designed to avoid the glare which is a particular problem for people with impaired vision. Large glass areas close to circulation spaces shall be marked a little below eyelevel with a coloured band or frame. Normally, the sill shall not be more than 800 mm from the floor. Windows shall be easy to open and close. A window schedule on the construction drawings shall give the dimensions, type, such as casement, double-hung, and so forth, and the number of lights (panes of glass) for each window in the structure.

2261.2.Ventilators

Windows and Ventilators are provided for the air circulation and daylight. But in case where window is not advisable ventilators are provided. Generally glazed ventilators with wooden or metal frames shall be provided in bathrooms, toilets, storerooms, dressing rooms etc.

2262. Hardware & Fasteners

Hardware accessories of approved quality made of metal or plastic that includes locks, hinges, door pulls, cabinet hardware, window fastenings, door closers and checks, door holders, and automatic exit devices shall be used. The fastening devices like nails, glues, screws, and bolts shall be of approved quality.

2263. Interior Finishes

Finishes for floors, walls and partitions, and ceilings is an important and make sure that each finishing job is properly done and gives a neat, attractive appearance Interior finishes are those materials installed to cover the surfaces of the floors, the walls, and the ceilings.

2263.1. Flooring and Floor Finishes

Floor materials found in shore establishment buildings and structures for various occupancies include wood, concrete, terrazzo, and clay tile. Common floor coverings include asphalt, vinyl tile, and linoleum. Common tiles in use are ceramic tiles, stone tiles, granite tile, marble and slate etc

2263.2. Laying of tiles

Clean the surface. Roughen the concrete under-bed to provide a good bond for the new setting cement. Dampen the under-bed and place the setting mortar mixed in the proportion of 1 part cement to 3 parts sand. Set the tile, tamping it to the level of the required finished floor. Fill the joints with grout or pointing mortar, matching the color and finish of floor as closely as possible. Grout joints 3 mm or less in width with neat cement grout of the consistency of thick cream. Point joints one-3mm to 6mm in width with pointing mortar, consisting of one-part cement to one-part screened sand. Point joints wider than 6 mm with pointing mortar consisting of one-part cement to two-parts screened sand. In locations, such as galleys and food-preparation areas, where the floor is directly exposed to the effects of corrosion agents,

acid-resistant joint material is used to fill the joints. The acid-resistant mortars are proprietary products and shall be mixed according to the manufacturer's recommendations.

2263.3. Grinding and Polishing

When grinding of a floor/Tile is required, it shall be started after the surface has hardened sufficiently to prevent dislodgement of particles or till the tile is fixed. The machines used shall be of an approved type. The floor is kept wet during the grinding process, and the cuttings are removed by squeegee and flushing with water. After the surface is ground, air holes, pits, and other blemishes are filled with a thin grout. This grout is spread over the floor and worked into the pits with a straightedge and rubbed into the floor with the grinding machine. When the filings have hardened a final grinding removes the film and gives the finish a polish. All surplus material is then removed by washing thoroughly. A rubbed finish is required when a uniform and attractive surface must be obtained. The first rubbing shall be done with coarse carborandum stones curing must precede until final rubbing. Finer carborandum stones are used for the final rubbing.

2264. Wall finishes

Plastering is the common type of wall finish for walls and partitions. Other types shall be drywall and wall tile.

2264.1.Plastering

Plastering using cement mortar as per specification shall be done for both interior and exterior walls.

2264.2. Drywall

Drywall construction is an alternative to plastering for walls and ceilings. Essentially, it consists of panels of wallboard of various types with joints tight, true, and effectively concealed. All materials used shall strictly adhere to the specifications. Ensure that the wallboard is applied accurately.

2264.3. Wall Tile

For wall finishes of baths, galleys, mess halls, hospital rooms, and other applications for which a highly sanitary, easily cleaned, impervious wall finish is required, glazed ceramic tile, glazed vitrified (waterproof) clay tile, and plastic tile shall be used. In the case of exterior walls, for better appearance, suitable tiles shall be used. Ensure that the tile furnished conforms to the specifications in kind, quality, size, colour, glaze, texture and grip.

2264.4. Stucco

This shall be done on walls, for acoustical effects in interiors and for an ornamental finish for exterior walls. It has to be ensured that the masonry has an unglazed rough surface with joints struck flush and adequate key to assure a good bond.

2264.5.Ceiling

Plastering is the common type of ceiling finish. Other types of finishes using tiles, boards etc. may be used. In case of large halls and auditoriums, for acoustics, special acoustical tiles and acoustical plaster of approved quality and specifications shall be used. Acoustical tiles are available in various materials, such as wood, vegetable or mineral fibre, perforated metal, or cemented shavings in different thicknesses, shapes, and dimensions and with varying textures, perforations, and joint treatment.

2265. Painting

2265.1.Surface Preparation

The most essential part of any painting job is proper surface preparation and repair. Each type of surface requires specific cleaning procedures. Before painting suitable priming coat shall be applied as per specifications and maximum possible time gap shall be allowed before painting is done. Paint will not adhere well, provide the protection necessary, or have the desired appearance unless the surface is in proper condition for painting. Exterior surface preparation is especially important because hostile environments can accelerate deterioration.

2265.1.1.Application of Paint

Painting shall be done to different types of surfaces, such as metal, wood, and concrete/ masonry. The common methods of applying paint are brushing, rolling, and spraying. The choice of method is based on several factors, such as speed of application, environment, type and area of surface, type of coating to be applied, desired appearance of finish, and training and experience of painters. Brushing is

ideal for small surfaces and odd shapes or for cutting in corners and edges. Rolling and spraying are efficient on large, flat surfaces. Spraying can also be used for round or irregular shapes. While spraying, adjacent areas not to be coated must be covered. Lacquer products, which dry rapidly, shall be sprayed.

2265.2. Interior Painting

Paint for interior walls and ceilings are usually flat wall paint. Interior enamel may be specified where a semi gloss or gloss washable finish is desired on woodwork or walls. A standard undercoat for primer under enamel, or use of the enamel with thinner may be permitted. Paint and enamel may be obtained with color added, or color-in-oil may be added to the white paint on the job. Specifications may require the sanding of interior woodwork or rubbing with steel wool. Priming of plaster surfaces with a glue size may also be required. Make sure that finish coats are of uniform gloss and color and are free from suction spots, highlights, brush marks, and other imperfections.

2265.3. White washing

The interior wall of ordinary buildings and all ceilings shall be whitewashed

2265.4. Colour washing

The interior wall of residential buildings and office buildings shall also be colour washed.

2265.5. Distemper washing

Interior walls of hospitals and other important buildings shall be given distemper coating.

In the case of prestigious buildings, plastic emulsion shall be provided.

2265.6. Exterior Painting

The exterior work includes steel structures, concrete masonry and woodwork. The exterior painting of steel structures, concrete, masonry and woodwork shall be done with special care for protection from environment.

2265.7. Metal and Steel Structures

Metal and Steel surfaces shall be cleaned by wire brushing, sandblasting, grit blasting, flame cleaning, cleaning with solvent, or air blasting, as may be specified; All surface rust, dirt, grease, oil, and loose scale shall be removed and if specified tight scale shall also be removed. Suitable priming coat shall be applied after cleaning the surface. The paint is worked thoroughly into all joints, cracks, and crevices. Each coat is allowed to dry thoroughly before the next coat is applied and the prescribed number of coats, each conforming to the requirements of the specifications, is applied. Nonferrous metal is usually not painted.

2265.8. Masonry walls

Painting of concrete, stucco, masonry walls and similar surfaces is done primarily for decorative purposes or for damp proofing walls. Paints usually are of white Portland cement base with color but may be of an oil base. Make sure that the materials conform to the standard specifications. Also determine whether surfaces are clean and free from dust, efflorescence, and other contamination and whether they are adequately cured. When Portland cement paint is used, be certain that the surface is thoroughly wetted. If oil-based paints are used, ensure that the surface is thoroughly cured, pretreated as specified, and thoroughly dry. In the case of prestigious buildings, good quality anti fungal paints shall be provided

2265.9. Woodwork

Make sure that surfaces are thoroughly dry and clean and are otherwise suitably prepared for painting before permitting work to proceed. Ensure that the priming coat is intact and is of suitable consistency to protect the wood, but not so tight that moisture in the wood is prevented from evaporating. Make sure that the wood is smooth enough to assure the continuity and adherence of the paint film; that holes and cracks are puttied or filled with wood filler; and that knots and pitch streaks are sealed with shellac, varnish, or other sealer, as prescribed. Make certain that the paints are of approved quality and color; and are applied by brushing, using high-quality brushes, until the coat is smooth, even, free from brush marks, and of uniform thickness, texture, and color. Also be sure that the paint is not brushed too thin to assure satisfactory hiding power; that each coat is allowed to dry thoroughly to a firm film before permitting application of the next coat; and that the specified number of coats is applied.

2266. List of relevant codes for painting

Document Number	Standard Title
IS 144: 1950	Ready mixed paint, brushing, petrol resisting, air-drying, for interior painting of tanks and container, red oxide (colour unspecified)
IS 145: 1950	Ready mixed paint, slushing, petrol resisting, air-drying for interior painting of tanks and containers, red oxide (colour unspecified)
IS 146: 1950	Specification for ready mixed paint, brushing, petrol resisting, stoving, or interior painting of tanks and containers, red oxide
IS 147: 1950	Specification for ready mixed paint, slushing, petrol resisting, stoving, for interior painting of tanks and containers, red oxide
IS 1200: Part 13: 1994	Method of measurement of building and civil engineering works: Part 13 Whitewashing, colour washing, distampering and painting of building surfaces
IS 1200: Part 15: 1987	Method of measurement of building and civil engineering works: Part 15 painting, polishing, varnishing etc
IS 1477: Part I: 2000	Code of Practice for Painting of Ferrous Metals in Buildings - Part I : Pretreatment
IS 1477: Part 2: 1971	Code of practice for painting of ferrous metals in buildings: Part2 Painting
IS 2395: Part 2: 1994	Code of practice for painting concrete, masonry and plaster surfaces: Part 2 Schedule
IS 2524: Part 1: 1968	Code of practice for painting of nonferrous metals in buildings: Part 1 Pretreatment
IS 2524: Part 2: 1968	Code of practice for painting of non-ferrous metals in buildings: Part 2 Painting
IS 3140: 1965	Code of practice for painting asbestos cement building products
IS 9954: 1981	Pictorial Surface Preparation Standards for Painting of Steel Surfaces
IS 14177: 1994	Guidelines for painting system for hydraulic gates and hoists
IS 14428: 1997	Guidelines for painting of structures in aggressive chemical environment

2266.1. Lighting and Ventilation

Refer National Building Code 2005, Part 8 Sec 215

2266.2. Electrical and Allied Installations

Refer National Building Code 2005 Part 8 Section 2

2266.3. Heating Ventilation and Air conditioning (HVAC)

Refer National Building Code 2005 Part 8 Section 3

2266.4. Acoustics sound Insulation and Noise control

Refer National Building Code 2005 Part 8 Section 4

2266.5. Lift and Escalators

Refer National Building Code 2005 Part 8 Section 5

2266.6. Stairs, passages

This shall be constructed as per the architectural and structural drawings.

2266.7. Water supply

Refer National Building Code 2005 Part 9 Section 1 clause 4

2266.8. Rain Water Harvesting

Refer National Building Code 2005 Part 9 Section 1 clause 5.5.12

2266.9. Drainage and Sanitation

Refer National Building Code 2005 Part 9 Section 1 clause 5

2266.10. Gas Supply

Refer National Building Code 2005 Part 9 Section 2

2266.11.Fire fighting

Refer National Building Code 2005 Part 4

2266.12.Landscaping, Signs and Outdoor Display Structures

Refer National Building Code 2005 Part 10 Section 2

2267. Completion Certificate

After the construction is complete in all respects, including provision of all service connections, the site must be returned to the parent department. The Assistant Engineer shall submit the completion certificate as per Appendix 4.13 along with as built drawings to the higher officers for approval. The final drawing must also include layouts of water supply and drainage system. Detailed drawings of electric connections, electronic and communications systems shall be handed over by the respective wings of PWD.

APPENDIX 2200A

Inspection Note (As per para 2212)

Inspection Notes of

Date of Inspection Estimate amount

Name of work Date of contract

Name of contractor Date of completion as per agreement.....

1. What is the stage of progress at present
2. Is the general progress of work satisfactory/unsatisfactory/poor
3. Are there any special difficulties affecting the progress of the work
4. Is the supply of departmental materials satisfactory
- 5 Are there any designs, working drawings or special instructions required from the Department which might hold up progress. If so what action has been taken
- 6 Remarks on the quality of work done so far
7. Do you find any need for deviation from sanctioned estimate of any particular item. If so briefly indicate measures of the nature of deviation
8. Any special instructions to subordinate officers
9. General remarks:

Appendix 2200B
Material Collection Report (As per para 2213)

Material Collection/ Initial Level Report No _____ Date of Reporting _____
 Name of Work _____ Name of Section _____
 Name of Subdivision _____
 If part supply reference to earlier report and
 clearance _____

Estimated PAC _____
 Agreed PAC _____
 Name of Contractor _____
 Agreement no. and date _____
 Tender Excess _____
 Date of handing over of Site _____
 Scheduled date of Completion _____

Sl no.	Description of item / supplied	Name of Locality, Km and chainage of road	Quantity as per agreement	Quantity measured	Reference to M.book/ Field Book		Date of measurement	Date of check measurement	Quantity as per check measurement	Upto date quantity	Remarks
			(M ³)	(M ³)	No	Page			(M ³)	(M ³)	

Submitted to the Chief Technical examiner
 Finance (Inspection Wing – Technical) Department
 of Assistant Executive Engineer with date
 SETEU Building, 3rd floor, Pulimoodu Thiruvananthapuram

Signature _____

Copy submitted to : Executive Engineer, PWD
 Superintending Engineer, PWD

APPENDIX 2200C

MACHINERY FOR EXCAVATION OF DIFFERENT OPERATION OF ROAD CONSTRUCTION (As per para 2215)

Sl. No.	Type of Soil	Choice of Roller/Plant	Remarks
A	Compaction of Embankment and Sub-grade		
A.1	Granular and dry cohesive soil	i 8-10 Ton three smooth wheeled roller	
		ii 80-100 kN vibratory compactor	
		iii Pneumatic tyred roller	Load per wheel 20 kN
A.2	Uniformly graded soil	i 8-10 Ton three smooth wheeled roller	
		ii Pneumatic tyred roller	Load per wheel 15 kN
		iii 8-10 Ton vibratory roller	
A.3	Cohesive soil	Sheep foot roller	
A.4	Cohesionless soil	Vibratory roller	
B	Earth Moving Operations		
B.1	Clearing and grubbing clearing light scrub, grass, etc.	i Dozer	
		ii Motor Grader	Can easily be used if scrub is very light
B.2	Clearing debris and rubble	i Dozer	
		ii Front end loader smaller size	
		iii Tractor with heavy duty	For clearance of large objects
B.3	Excavation, earth movement and embankment		
B.3.1	Light and medium soils requiring preliminary loosening	i Dozer	Best unit for hauls of under 90m Also, for hill cuts and cuts down vertical faces for roads
		ii Scraper tractor towed/ motorised	Tractor towed scraper for hauls for 60m to 300m. Motorised scraper for hauls of 300m and above
		iii Excavator and dumper	Best unit for shallow road embankments across generally flat terrains
		iv Front end loader and tipping truck	
B.3.2	Heavy soils	i Dozer, Crawler/ Dozer wheeled	
		ii Towed scraper with pusher/ Motorised scraper with pusher, preceded by rooter	
		iii Motor grader preceded by tractor towed rooter	Preliminary rooting is essential from motor graders

Sl. No.	Type of Soil	Choice of Roller/Plant	Remarks
B.4	Spreading : Distributing fill in layers of uniform thickness	i Scraper, tractor towed or motorised	Best machine for hauling and spreading thin layers of material
		ii Motor Grader	Used for spreading and withdrawing materials of workable nature
		iii Tipping Trucks	Can spread their loads to a limited extent
		iv Crawler Dozer	Best machine for initial spreading of workable material
B.5	Cambering	i Motor Grader	Best machine for providing final camber
		ii Crawler Dozer	Can provide camber during initial excavation for road formation
		iii Scraper, tractor towed or motorized	Can provide camber during initial excavation for road formation
B.6	Scarifying and shaping earth roads	Grader with scarifier	Best machine for loosening for shaping top layer of earth
B.7	Maintenance of earth haul roads	i Motor grader/ wheel crawler	Best machine for this work
		ii Wheel / Crawler dozer	Should be used only if grader not available
B.8	Watering	i Truck or trailer mounted water tanker with a sprinkler and water pump	
C	Compaction		
C.1	Soil Stabilisation	i 8-10 ton three smooth wheeled roller	
		ii Vibrating roller	
C.2	Granular base/ Sub Base	i 8-10 ton three smooth wheeled roller	
		ii Vibrating roller	
C.3	Macadam and other coarse aggregate base courses	i 8-10 ton three smooth wheeled roller	
		ii Steel wheeled Vibratory roller	
C.4	Mix-in-place Asphalt base course	i 8-10 ton three smooth wheeled roller	
		ii Vibratory compactor tandem 8-10ton	
		iii Pneumatic Tyre roller	
C.5	Plant-mix base leveling or surface courses	i 8-10 ton three smooth wheeled roller	For break-down rolling
		ii Steel wheeled tandem roller	For break-down rolling
		iii Pneumatic tyred roller(Self propelled)	For intermediate rolling
		iv Tandom Roller	For intermediate rolling
		v Rubber tyred roller	For final rolling

Sl. No.	Type of Soil	Choice of Roller/Plant	Remarks
D	Bituminous Pavement		
D.1	Surface dressing	i Bitumen pressure distributor, if bulk bitumen supply is available	For uniform application of binder
		ii Chip spreader	For even spreading of chips to correct thickness
D.2	Bituminous grouting (Penetration machine) Semi grout and Full Grout	i Bitumen boilers with sprayers	
		ii Bitumen pressure distributor if bitumen is supplied, in bulk.	
D.3	Seal coat	Mini hot mix plant (6-10 ton/hr capacity)	For laying manually
D.4	Premix carpet	i 20-30 and 40-60 tons/ hr hot mix plant	If there is sufficient work load
		ii Paver finisher	Paver finisher for mechanical spreading and tipping truck for haulage would be a good combination.
		iii Tipping Truck	
		iv 8-10 ton three smooth wheeled roller	
		v Rubber tyred roller	
D.5	Hot mix BM/AC	i Mechanical broom	
		ii Bitumen boilers with sprayers	For tack coat
		iii Bitumen pressure distributors	
		iv Hot mix plant 40-060 ton or more/ hr	Batch or continuous type
		v Electronic paver finisher with sensor	To match the capacity of hot mix plant
		vi Tipping Trucks	6-8 nos depending on the distance from the plant
		vii Front end loaders	For cold feed loading
		viii Generators if required	For electrical hot mix plants
		ix 8-10 ton three smooth wheeled roller	
		x Vibratory tandem roller	
		xi Rubber tyred roller	
E	Sub base/ base course		
E.1	Soil Stabilisation	i Soil Stabiliser	
		ii Rotavater	
		iii Vibratory road roller	
		iv 8-10 ton three smooth wheeled roller	
		v Water Sprinkler	
E.2	Water Bound Macadam (WBM)	i Aggregate spreader	
		ii Water Sprinkler	

Sl. No.	Type of Soil	Choice of Roller/Plant	Remarks
		iii 8-10 ton three smooth wheeled roller	
		iv Tipping Trucks	
E.3	Wet Mix Macadam (WMM)	i Multi-stage stone crushing plant	
		ii Concrete mixer	Suitable for small quantity of works
		iii Wet Mix plant	Plant should have tin shaft pug mill
		iv Paver Finisher	It has better control of thickness and profile
		v Tipping Trucks	
		vi 8-10 ton three smooth wheeled roller	
		vii Vibratory road roller	
E.4	Granular Sub base (GSB)	i Motor Grader	
		ii Tipping Trucks	
		iii 10 ton three smooth wheeled roller	
		iv Vibratory road roller	
		v Water Sprinkler	
F	Concrete Pavements		
F.1	Dry Lean Concrete (DLC)	i Multi Stage Stone crushing Plant	
		ii Concrete Batching/ Mix Plant	
		iii Mixed Form Paver	
		iv Transit Mixer	
		v Compactor	
F.2	Paving Quality Concrete (PQC)	i Multi Stage Stone crushing Plant	
		ii Concrete Batching/ Mix Plant	
		iii Fixed Form/ Slip Form Paver finisher	
		iv Concrete Cutter (Saw Cutting machine)	
		v Texturing machine	
		vi Curing machine	
		vii Concrete Placer	
		viii Transit Mixer	
		ix Dowel bar Inserter	

APPENDIX 2200D

Tentative Output of Road Machinery (As per para 2215)

Machine/ Tool	Output
1 Scraper (Motorised) towed	160 cum/day
2 Dozer	200 cum/day
3 Motor Grader	600 cum/day
4 Excavator 1 m ³ capacity	400 cum/day
5 Three smooth wheeled road roller	
5.1 Earth work	450 cum/day
5.2 Moorum/Gravel	450 cum/day
5.3 Pavement	
5.3.1 WBM Stone base course	45 cum/day
5.3.2 WBM/ WMM wearing course	40 cum/day
5.3.3 DBM	40 cum/day
5.4 Surface Dressing	
5.4.1 First Coat	2500 Sqm/ day
5.4.2 Second Coat	3500 Sqm/ day
5.5 Premix Carpet	
5.5.1 25 mm Thick	2000 Sqm/ day
5.5.2 20 mm Thick	2000 Sqm/ day
6 Earthwork compaction by sheep foot road roller	600 cum/day
7 Vibratory Road Roller earth-work (Depends on layer thickness and type)	600 cum/day
8 Other Machinery	
8.1 Mini-Hot Mix Plant 6-10 TPH	8 Ton/Hr
8.2 Hot Mix Plant 40-60 TPH	50 Ton/Hr
8.3 Paver Finisher 75-160 TPH	75 Ton/Hr
8.4 Bitumen Boiler	2000 Litr/hr
8.5 Water Tankers	10,000 litres
8.6 Bitumen Pressure Distributors	10,000 litres
8.7 Wet Mix Macadam Plant 60 TPH	50 Ton/Hr
8.8 Stone crusher less than 100 ton/ hr	Depends on requirement
8.9 Multistage Stone crusher more than 100ton/hr	Depends on requirement
8.10 Concrete Batch mixing Plant upto 50 cum/Hr	40 cum/hr
8.11 Concrete Batching Mix more than 50 cum/Hr	Depends on requirement
9 Haulage by trucks/Tippers	
9.1 When lead = 2 km	8 Trips per day
9.2 When lead = 8 km	6 Trips per day
9.3 When Lead = 16 km	5 trips per day
9.4 When lead = 30 km	4 trips per day

APPENDIX 2200E

Details to be submitted for Approval from Engineer to start work (As per para 2218.1)

- (i) Source and location of all materials;
- (ii) Proportions of all materials expressed as follows where each is applicable:
 - (a) Binder type, as percentage by weight of total mixture;
 - (b) Coarse aggregate/Fine aggregate/Mineral filler as percentage by weight of total aggregate including mineral filler;
- (iii) A single definite percentage passing each sieve for the mixed aggregate;
- (iv) The individual gradings of the individual aggregate fractions, and the proportion of each in the combined grading.
- (v) Physical properties of the mix detailed in the relevant sections as obtained by the Contractor;
- (vi) Where the mixer is a batch mixer, the individual weights of each type of aggregate, and binder per batch,
- (vii) Test results of physical characteristics of aggregates to be used;
- (viii) Mixing temperature and compacting temperature.

APPENDIX 2200F

PROFORMA OF PROGRESS OF WELL STEINING AND SINKING (As per para 2237.2)

Note: Give the number plan of the wells on the first page.

*Heading of columns shall be as given below:

1. Date
2. Time of observation
3. Well No.
4. Work done during 24 hours preceding time of observations
steining/sinking
5. Steining works:
 - (i) R.L. at the top of well and the time of observation.
 - (ii) R.L. at top of well at the time of last observation
 - (iii) Steining done since last observations (i) minus (ii)
 - (iv) Gauge upto which steining done to date including height of curbs
 - (v) R.L. of bottom of curb (i)-(iv)
 - (vi) R.L. of L.W.L. as per contract.
6. Total sinking done up-to-date:
7. Total sinking done as per last observation
8. Sinking done since last observation (6)-(7)
9. Sump observation:
 - (i) Depth of bottom of sump below top of well
 - (ii) Magnitude of sump 9(i) - 5(iv)
10. Strata met with at the time of observation
11. Any obstacle met since last observation
12. Any plastering done since last observation
13. Any sand blowing took place since last observation.
14. Kentledge observations:
 - (i) Extra kentledge over the well
 - (ii) Eccentricity along X - axis
 - (iii) Eccentricity along Y-axis
 - (iv) Approximate total quantity of dredged materials on last observation
 - (v) Approximate quantity of dredged materials at the time of observation
 - (vi) Approximate quantity of dredged materials since last observation
15. Is any special method of sinking being employed at the time of observation?
16. If so, give brief description in Remarks column Remarks.
17. Signature of official taking the observation
18. Signature of Assistant Engineer in token of check.
19. Signature of Executive Engineer/Superintending Engineer in token of having seen the register.

APPENDIX 2200G

PROFORMA FOR RECORDING TILTS AND SHIFTS OF WELLS(As per para 2237.2)

Note: Give the numbering plan of the wells on the first page.

*Heading of columns shall be as given below:

1. Date
2. Time of observation
3. Well No.
4. Total steining done in the well up-to-date (vide column 5(iv) of proforma of progress of sinking)
5. Total sinking done up-to-date (vide column 6 of proforma of progress of sinking).
6. Reduced levels at the gauge marks on the tilted plane:
 - (i) Along X axis (traffic axis)
Side
(say north side) (say south side)
 - (ii) Along Y axis (perpendicular to traffic axis)
On downstream side On upstream side
7. Difference in levels taken on the tilted plane:
 - (i) Along X-axis.
 - (ii) Along Y-axis
8. Extent of tilt:
 - (i) Along X-axis
 - (ii) Along Y-axis
9. Shifts:
 - (i) Along X-axis
 - (ii) Along Y-axis
10. Action being taken in case tilt has exceeded 1/80 and shift 150 mm
11. Remarks.
12. Signature of the official taking observation
13. Signature of Assistant Engineer in token of check
14. Signature of Executive Engineer/Superintending Engineer in token of having seen the register

APPENDIX 2200H

STATEMENT SHOWING PARTICULARS OF DIFFERENT METHODS ADOPTED AND PHENOMENON ENCOUNTERED DURING WELL SINKING ON DIFFERENT WELLS

(As per para 2337.2)

of _____ bridge on _____ Road _____ District

1. Well No _____ (Below _____ Side Abutment/Pier No.....)

*Heading of column shall be as given below:

1. Date
2. Total steining upto date
3. Total sinking upto date
4. Working progress on steining or sinking
5. Total weight available for sinking:
 - (i) Weight of well for portion below water level allowing for buoyancy
 - (ii) Weight of well above water level
 - (iii) Kentledge weight
6. Total
7. Eccentricity of kentledge:
 - (i) Along X-axis
 - (ii) Along Y-axis
8. Hours of working for which sinking was done
9. Quantity of Material taken out from well Pocket:
 - (i) During last 24 hours
 - (ii) Per running metre of sinking of well done in 24 hours
10. Details of explosive if used and name of person in whose presence it was used.
11. Whether dewatering was done during sinking and if so how much below river water level

12. Whether dewatering was done after bottom plugging and if so how much below river water level
13. Rate of rise of water inside the well in dewatering test Remarks
14. Signature of person recording the information

APPENDIX – 2400

Table 2400.1 Physical Requirements of Aggregates for bituminous base course

	Property	Test	IS Code	Requirement for BM, BPM and BUSG	Requirement for DBM
1	Cleanliness	Grain Size analysis	IS 2386 Part 1	Max. 5% passing 0.075 mm IS sieve	Max. 5% passing 0.075 mm IS sieve
2	Particle shape	Flakiness & Elongation Indices (Combined)	IS 2386 Part 1	Max. 30%	Max. 30%
3	Strength	Los Angels Abrasion Value	IS 2386 Part 4	Max. 40%	Max. 35%
		Aggregate Impact Value	IS 2386 Part 4	Max. 30%	Max. 27%
4	Durability	Soundness:	IS 2386 Part 4		
		Sodium Sulphate Magnesium Sulphate		Max. 12% Max. 18%	Max. 12% Max. 18%
5	Water Absorption	Water Absorption	IS 2386 Part 3	Max. 2%	Max. 2%
6	Stripping	Coating and Stripping of Bitumen aggregate Mixtures	IS 6241	Min. 95% retained coating	Min. 95% retained coating
7	Water Sensitivity	Retained Tensile Strength		Min. 80%	Min. 80%

Table 2400.2 Physical Requirements for Coarse Aggregate in Surface (wearing) Courses

Property	Test	IS Code	Specification			
			SDBC / BC	Surface Dressing	Premix (Open/ graded)	Carpet Close	Mastic Asphalt
Cleanliness	Grain Size Analysis	IS 2386 Part 1	Max 5 % passing 0.075 mm sieve	Max 5 % passing 0.075 mm sieve	Max 5 % passing 0.075 mm sieve	Max 5 % passing 0.075 mm sieve
Particle shape	Flakiness & Elongation Indices (Combined)	IS 2386 Part 1	Max 30%	Max 30%	Max 30%	Max 30%
Strength	Los Angels Abrasion Value	IS 2386 Part 4	Max 35 %	Max 40 %	Max 40 %	Max 40 %
	Aggregate Impact Value	IS 2386 Part 4	Max 27 % (SDBC), 24% (BC)	Max 30 %	Max 30 %	Max 30 %
Polishing	Polished Stone Value	BS 812 Part 114	Min 55	Min 60	Min 55	-
Durability	Soundness: Sodium Sulphate	IS 2386 Part 4	Max 12 %	Max 12 %	Max 12 %	Max 12 %
	Soundness: Magnesium Sulphate	IS 2386 Part 4	Max 18%	Max 18%	Max 18%	Max 18%
Water Absorption	Water Absorption	IS 2386 Part 3	Max 2 % in exceptional cases)	Max 1%	Max 1%	Max 2%

Stripping	Coating & Stripping of Bitumen aggregate Mixtures	IS 6241	Min retained coating 95 %	Min retained coating 95 %	Min retained coating 95 %	Min retained coating 95 %
Water Sensitivity	Retained Tensile Strength	AASHTO T283	Min 80 %	Min 80 %	Min 80 %	Min 80 %

Notes: 1. IS: 2386 Part 1 6. IS: 2386 Part 5

2. IS: 2386 Part 1 7. IS: 2386 Part 3 (the elongation test may be done only on non-flaky aggregates in the sample)

3. IS: 2386 Part 4* 8. AASHTOT283**

4. IS: 2386 Part 4* 9. IS: 6241

5. BS: 812 Part 114

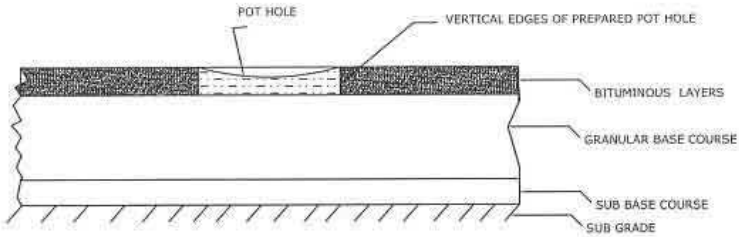
* Aggregate may satisfy requirements of either of these two tests.

** The water sensitivity test is only required if the minimum retained coating in the stripping test is less than 95%.

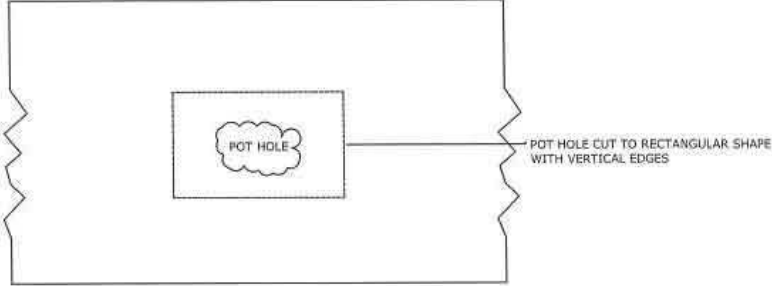
Table 2400.3 requirements of Mix for Surface (wearing) course

Sl No.	Description		Requirements	
			SDBC	BC
1	Marshall Stability (at 60oC	(ASTM D 1559) determined on Marshall specimens 75 compaction blows on each end	8.20 KN min.	
2	Marshall Flow (mm)		2 to 4	
3	Percent air voids in mix		3 to 5	3 to 6
4	Percent air voids in mineral aggregate (VMA) (min)		13 to 15	11-13
5	Percentage voids in mineral aggregates filled with bitumen (VFB)		65 to 78	65 to 75
6	Binder content, Percent by weight of mix		4.5 min	5 min
7	Water sensitivity	(ASTM D 1075) loss of stability on immersion in water at 60 o C		Minimum 75 % retained strength

APPENDIX - 2402 A

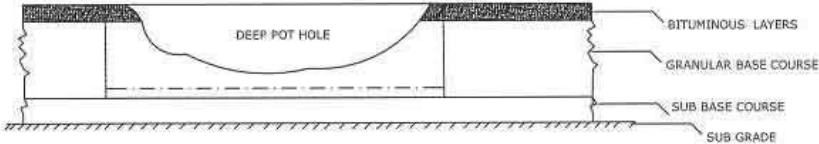


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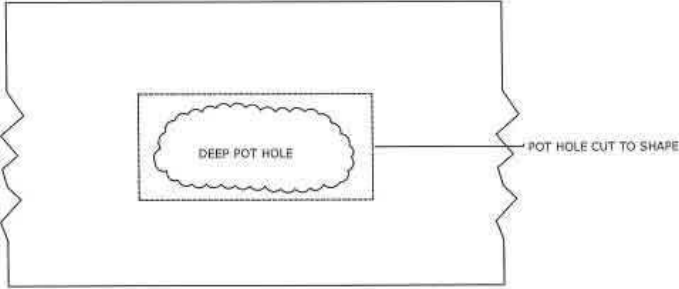


PLAN

POT HOLE OF SHALLOW DEPTH



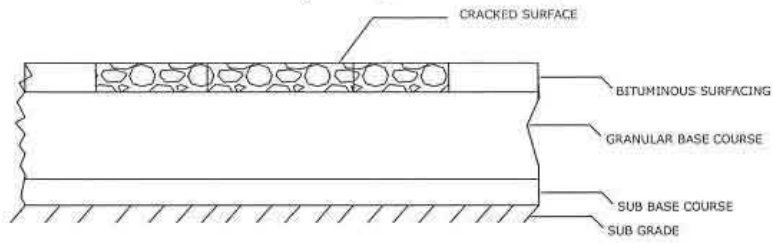
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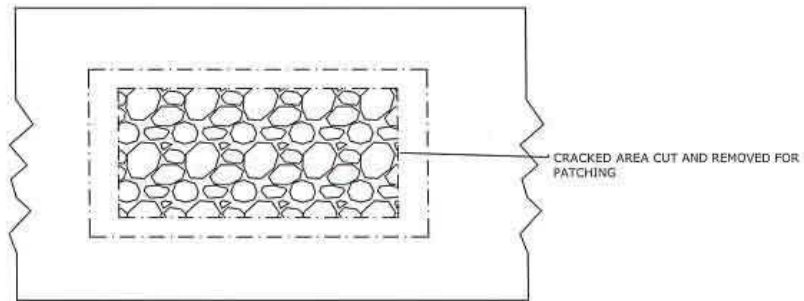
PLAN

DEEP POT HOLE

APPENDIX - 2402 B

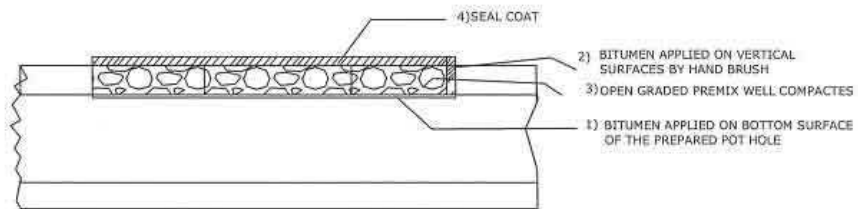


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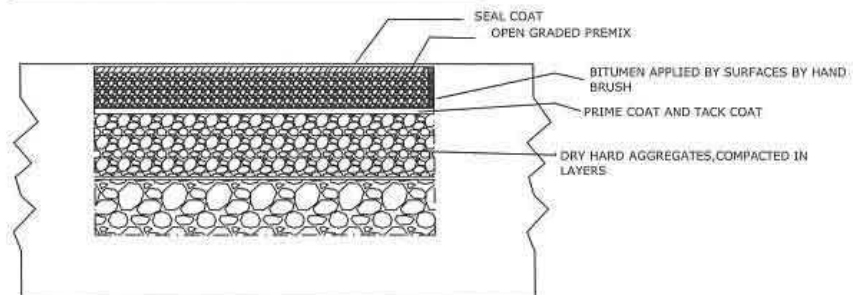
PLAN

ISOLATED AREA WITH ALLIGATOR CRACKING



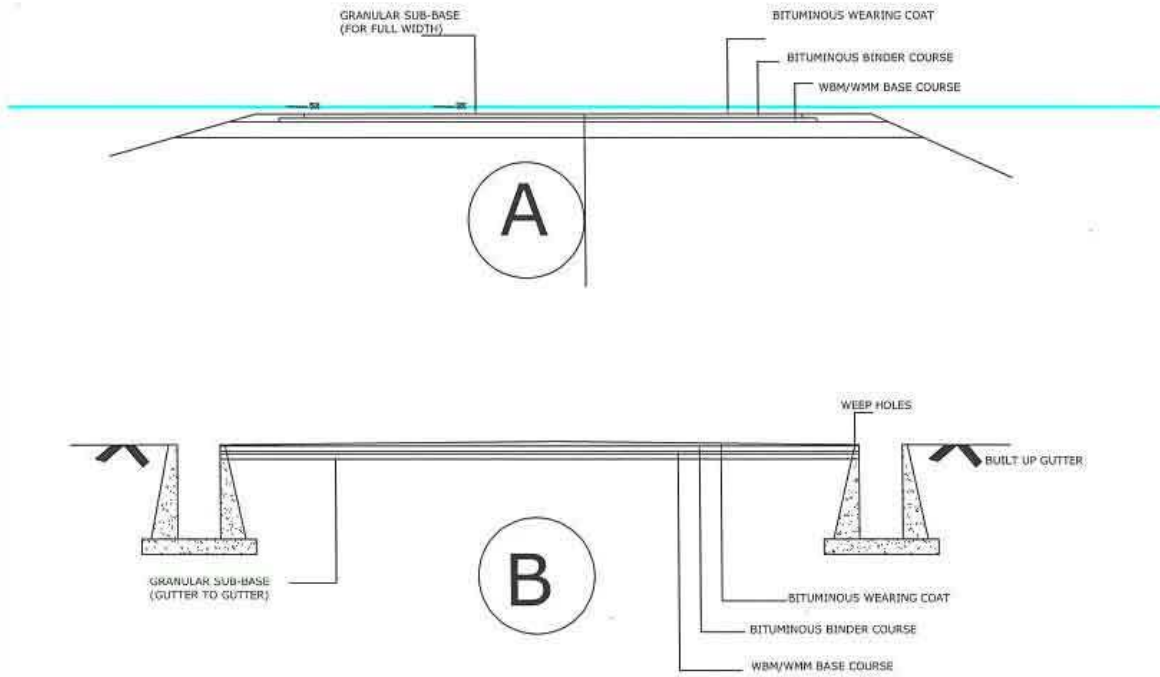
SECTION

PATCHING POT HOLE OF SHALLOW DEPTH



PATCHING DEEP POT HOLES

APPENDIX - 2407 A

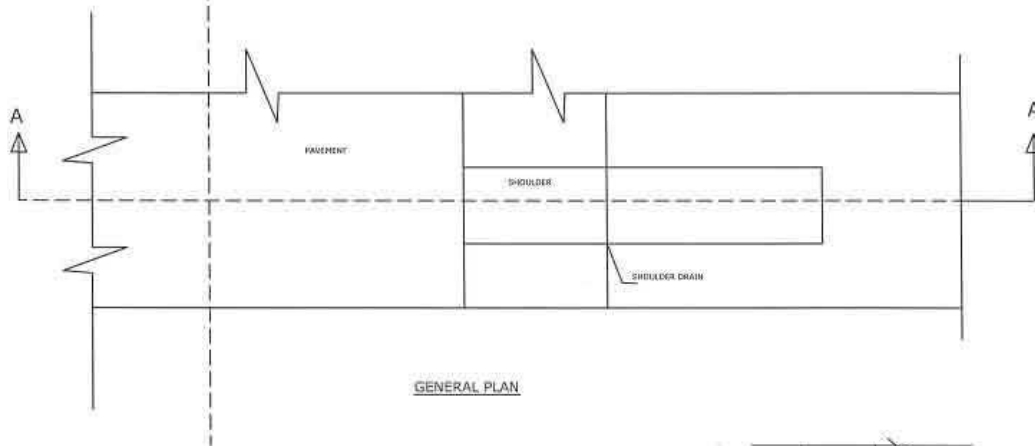
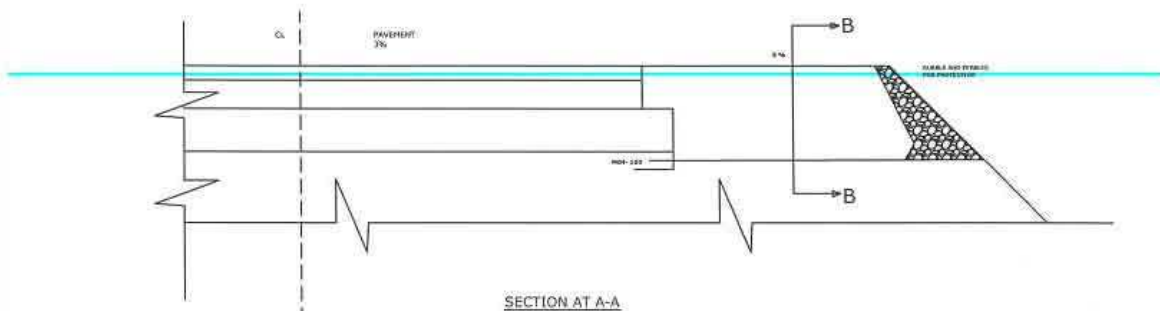


TYPICAL CROSS SECTION OF ROADS SHOWING PAVEMENT COMPOSITION

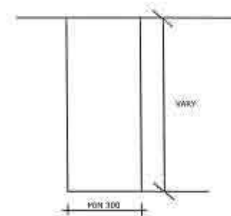
A IN EMBANKMENT

B WITH BUILT-UP GUTTERS

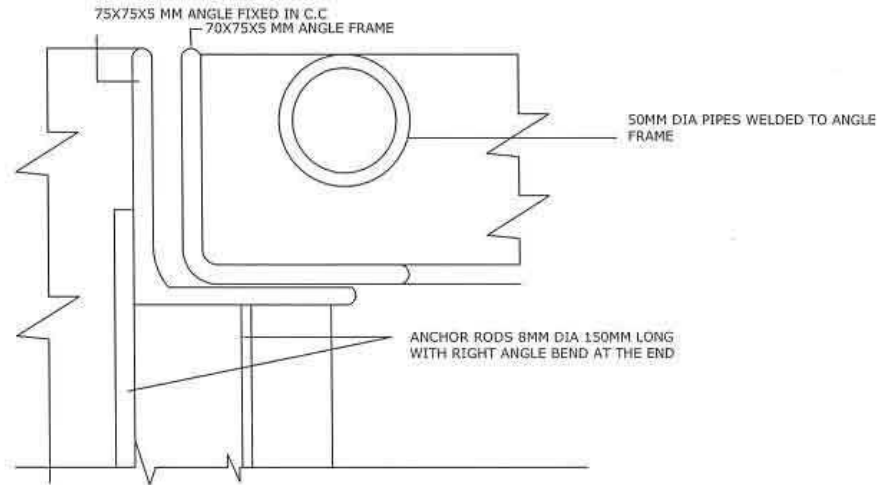
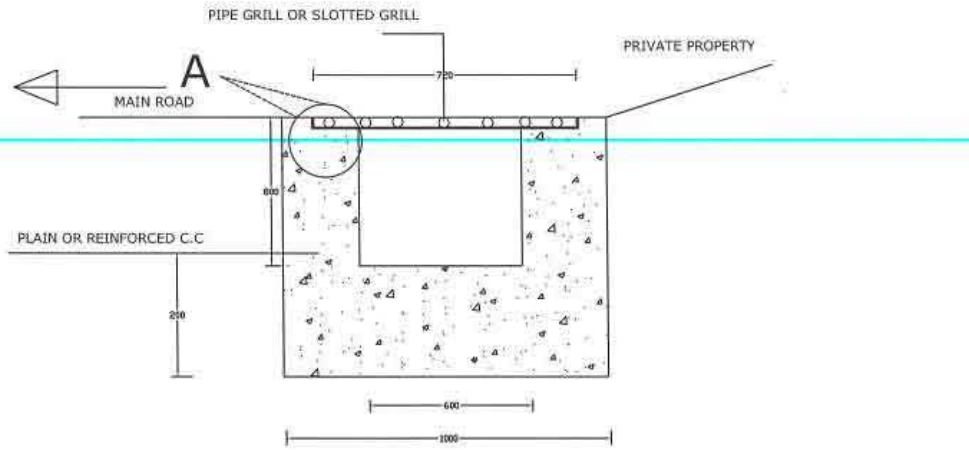
APPENDIX - 2401 B



- NOTES:-**
- 1) BOTTOM OF DRAIN SHOULD BE AT LEAST 150MM LOWER THAN THE BOTTOM OF THE CRUST.
 - 2) BED SLOPE SHOULD BE 5%
 - 3) SHOULDER BE PROVIDED AT CRONIC DAMAGE PORTIONS AND C/C DISTANCE SHOULD BE 5 TO 10M.
 - 4) SHOULD BE FILLED WITH GRANULAR MATERIAL
eg: SAND, SHINGLE, AGGREGATE.



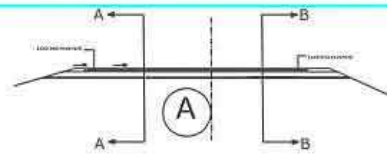
APPENDIX - 2407 C



DETAILS AT A

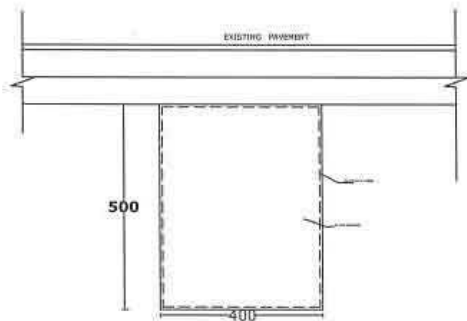
CATTLE TRAP OR INTERCEPTER DRAIN

APPENDIX - 2407 D

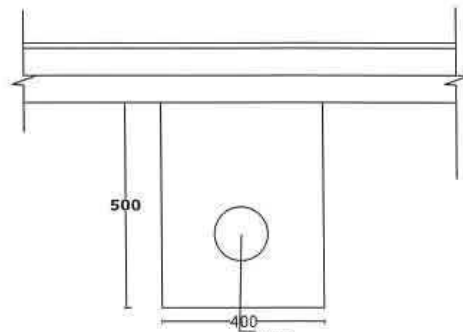


HALF PORTION SHOWING CONVENTIONAL SUB SOIL DRAIN

HALF PORTION SHOWING SUB SOIL DRAIN WITH PIPE



SECTION AT A-A



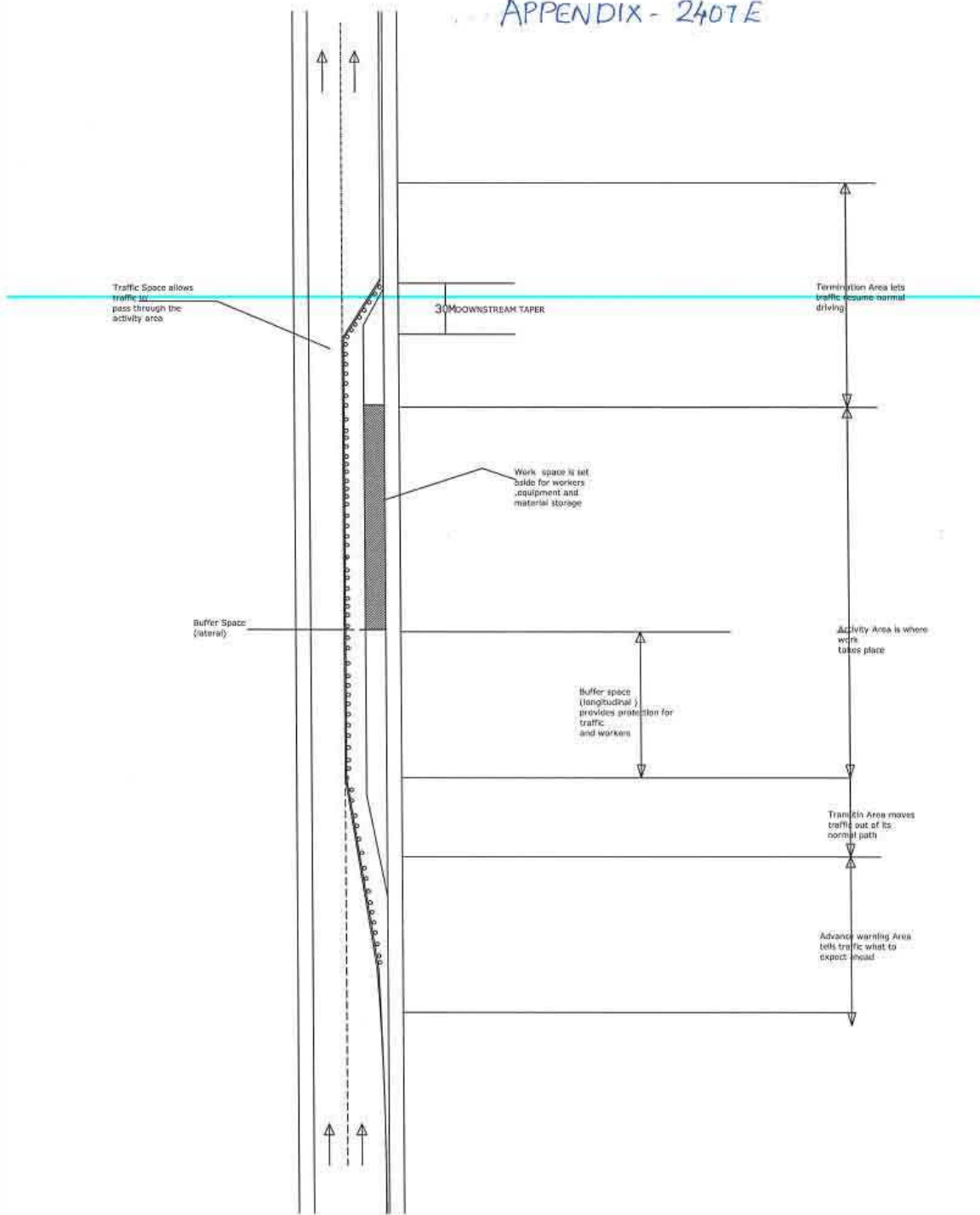
SECTION AT B-B

NOTES:

- 1) SUB SOIL DRAINS SHOULD BE PROVIDED TO QUICKLY DRAIN AWAY MOISTURE IN THE BODY OF ROAD STRUCTURE.
- 2) IT SHOULD ALSO BE PROVIDED IN CLAYEY SOILS HAVING VERY LOW PERMEABILITY.
- 3) CASING OF GEOTEXILE/HESIAN CLOTH IS DESIRABLE TO AVOID CHOAKING OF FILTER MATERIAL.

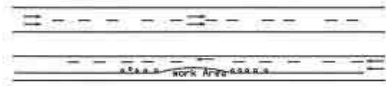
SUB SOIL DRAIN

APPENDIX - 2407E

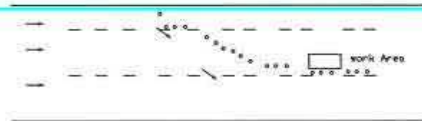


Components of work zone Traffic control

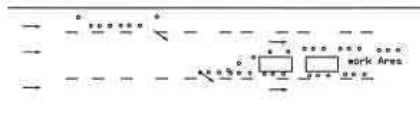
APPENDIX - 2407 F



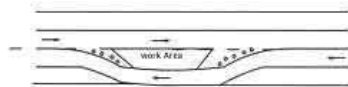
A-Single lane closure



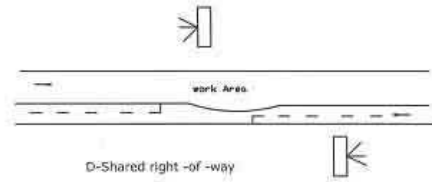
B-Multi lane closure



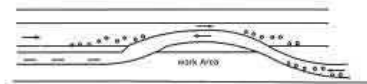
C-Traffic splitting



E-Temporary By -Pass



D-Shared right -of -way



F-Temporary By -Pass



G-Shoulder Utilisation Strategy

Work Zone Traffic Control strategies

Appendix 2600A

Type of distress, Symptoms, Probable causes and possible types of treatment (As per Para 2601.1)

Sl no	Type of distress	Symptoms	Probable causes	Possible types of treatment
A	Surface defects			
1	Fatty surface	Collection of binder on the surface	Excessive binder in premix, spray or tack coat, loss of cover to aggregates; excessively heavy axle loads	Sand blinding; open-graded premix; liquid seal coat; burning of excess binder; removal of affected area
2	Smooth surface	Slippery	Polishing of aggregates under traffic, excessive binder	Resurfacing with surface dressing or premix carpet
3	Streaking	Presence of alternate lean and heavy lines of bitumen	Non-uniform application of bitumen or at a low temperature	Application of a new surface
4	Hungry surface	Loss of aggregates or presence of fine cracks	Use of less bitumen or absorptive aggregates	Slurry seal or Fog seal
B	Cracks			
1	Hairline cracks	Short and fine cracks at close intervals on the surface	Insufficient bitumen, excessive filler or improper compaction	The treatment will depend on whether pavement is structurally sound, or unsound. Where the pavement is structurally sound, the cracks should be filled with a low viscosity binder or a slurry seal or fog seal depending upon the width of cracks Unsound cracked pavements will need strengthening or rehabilitation treatment
2	Alligator cracks	Interconnected cracks forming a series of small blocks	Weak pavement, unstable conditions of subgrade or lower layers, excessive over loads or brittleness of binder	
3.	Longitudinal cracks	Crack on a straight line along the road	Poor drainage, shoulder settlement, weak joint between adjoining spreads of pavement layers or differential frost heave	
4.	Edge crack	Crack near and parallel to pavement edge	Lack of support from shoulder, poor drainage, frost heave or inadequate pavement width	
5.	Shrinkage cracks	Cracks in transverse direction or interconnected cracks forming a series of large blocks	Shrinkage of bituminous layer with age	
6.	Reflection cracks	Sympathetic cracks over joints and cracks in the pavement underneath	Due to joints and cracks in the pavement layer underneath	
C.	Deformation			
1.	Slippage	Formation of crescent-shaped cracks pointing in the direction of the thrust of wheels	Usual thrust of wheel in a direction, lack or failure of bond between surface and lower pavement courses	Removal of the surface layer in the affected area and replacement with fresh material
2.	Rutting	Longitudinal depression in the wheel tracks	Heavy channelised traffic, inadequate compaction of pavement layers, poor stability of pavement material,	Filling the depressions with premix material

			or heavy bullock cart traffic	
3.	Corrugations	Formation of spots regular undulations	Lack of stability in mix, oscillations set up by vehicles, springs, or faulty laying of surface course	Scarification and relaying of surfacings, of cutting of high spots and filling of low spots
4.	Shoving	Localised bulging of pavement surface along the crescent shaped cracks	Unstable mix, lack of bond between layers, or stop type movements and those involving negotiation of curves and gradients	Removing the material to firm base and relaying a stable mix
5.	Shallow depressions	Localised shallow depressions	Presence of inadequately compacted pockets	Filling with premix materials
6.	Settlement and upheaval	Large deformation of pavement	Poor compaction of fills poor drainage, inadequate pavement or frost heave	Where fill is weak, the defective fill should be excavated and re-done. Where inadequate pavement is the cause, the pavement should be strengthened.
D	Disintegration			
1	Stripping	Separation of bitumen from aggregate in the presence of moisture	Use of hydrophilic aggregate, inadequate mix composition, continuous contact with water, poor bond between binder and aggregate, poor compaction, etc.	Spreading and compacting heated sand over the affected area in the case of surface dressing; replacement with fresh bituminous mix with added anti-stripping agent in other cases
2	Loss of Aggregate	Rough surface with loss of aggregate in some portions	Ageing and hardening of binder, stripping, poor bond between binder and aggregate, insufficient binder, brittleness of binder, etc.	Application of liquid seal, fog seal or slurry seal depending on the extent of damage.
3	Ravelling	Failure of binder to hold the aggregate shown up by pock marks or eroded areas on the surface	Poor compaction, poor bond between binder and or aggregate, insufficient binder, brittleness of binder, etc	Application of cutback covered with coarse sand or slurry seal or a premix renewal coat
4	Pothole	Appearance of bowl-shaped holes usually after rain	Ingress of water into the pavement, lack of bond between the surfacing and WBM base, insufficient bitumen content, etc	Filling potholes with premix material or penetration patching
5	Edge- breaking	Irregular breakage of pavement edges	Water infiltration, poor lateral support from shoulders inadequate strength of pavement edges, etc	Cutting the affected area to regular sections and re-building with simultaneous attention paid to the proper construction of shoulders

Appendix 2600B
Maintenance criteria (As per Para 2601.1)

	Features	Criteria	Action	Priority
A	Features concerned with safety of Traffic			
A1	Major breaches in the road way	Any type of breach which endangers safety of traffic and causes obstructions to flow of traffic	Steps to be taken as per clause 14.7 of MoRTH Handbook	Urgent
A2	Minor cuts or blockades	Cuts or blockades which do not completely obstruct traffic but endanger safety of traffic	Get blockades removed and get the cuts repaired	Urgent
A.3	Branches of trees at height less than 4.5 m over the roadway	Any kind	Get them cut in order of lower ones first	Special attention
B.	Carriageway and crust conditions			
B-1	Cracking not accompanied by rutting	a) Cracking in local areas equal to or less than 25 per cent of the total area	a) Local sealing or filling of the cracks preferably with slurry seal or fog seal or as per Ministry's Specifications	Routine
			b) Binder @ 1.5 kglm ² of bitumen emulsion or 1 kglm ² of cut -back or local sealing	
		b) Cracking in large areas exceeding 25 per cent of the total area	c) Surface Dripping as per Ministry's specifications	Special attention
B-2	Stripping	a) In local areas not exceeding 25 per cent of the total area	Apply local sealing	Routine
		b) In long areas exceeding 25 per cent of the total area	Apply surface dressing use antistripping compounds	Special attention
B.3	Bleeding	a) In local areas not exceeding 25 per cent of the total area	Spread and roll over 6 mm size aggregate, heated to 60°C	Routine
		b) In local areas exceeding 25 per cent of total area	Apply surface dressing	Special attention
B-4	Rutting	a) Less than 50 mm accompanied by cracking	Apply tack coat @ 0.5 kglm ² and fill bituminous, mix using a rake and leaving an excess thickness of about one- third the depth of rut. Compact till surface is levelled and local sealing of cracks.	Routine
		b) More than 50 mm accompanied by cracking	With surface dressing over cracks, overlay required	Work of original nature
B-5	Potholes	Potholes, as soon as they occur	required Local restoration by patching preferable	Special attention
B-6	Reflection cracks	a) Widely spaced cracks	Slurry for fog seal	Recurrent
		b) Closely spaced	Apply surface dressing use of geotextiles	Special attention

	Features	Criteria	Action	Priority
B-7	Edge subsidence and rutting	Any extent	Patch road edge and repair shoulder	Recurrent
B-8	Defective camber	Any extent	Check and correct by reconstructing to proper camber profile	Special attention
B-9	Undulations	Any extent	Investigate the cause and rectify	Special attention
B-10	Loss of material from unpaved road	Any extent	Investigate the cause and rectify	Special attention
C	Shoulders-side-drains			
C-1	Deformation or scour of shoulders	Any extent	Fill and compact and bring its surface to desired camber	Routine
C-2	Silting of side-drains	Any extent	Clean out the drains	Routine
C-3	Damage or scouring of drain	Any extent	Reconstruct to adequate shape and size	Special attention
D.	C.D. Works			
D-1	Causeways			
	a) Potholes in paved. surface	Any extent	Repair by filling	Special attention
	b) Erosion at inlet/outlet	Any extent	Repair	Special attention
	c) Guide posts/ flood guage missing	Any	Repairs/ Replace	Special attention
D -2	Culverts			
	a) Silting	Any	Desilting	Special attention
	b) Erosion at inlet/outlet	Any extent	Repairs	Special attention
	c) Settlement cracks	Any	Repairs	Special attention
E.	Other Works			
E-1	Road furniture and warning dirty or corroded or damaged missing	Any extent	Clean and repair/replace	Routine
E-2	Missing road signs	Any	Fix new one	Special attention

Appendix 2600C

Road Register (As per Para 2602)

A: Format for Road Inventory

Public Works Department, Kerala State

Road Name:

Section:

Name of Official with Designation:

Type of Road: SH MDR R VR OD

Road Number
Sub-Division:

Division:

Sub-Division:

Road Starts at (Location):

Starting Chainage:

Date of Survey

Road Ends at (Location):

Ending Chainage:

Road Length (km):

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Chainage (km)		Carriageway		Median	Drain Type & Condition						Shoulder Type Condition							
From	To	Type	Width (m)	Width (m)	LHS			RHS			LHS				RHS			
					Type	Existing Length (m)	Condition	Type	Existing Length (m)	Condition	Type	Existing Width (m)	Condition (cut/fill)	Depth of Cut/Fill (cm)	Type	Existing Width (m)	Condition (cut/fill)	Depth of Cut/Fill (cm)

20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Footpath Type Condition						Distance of PWD Boundary from Edge of Carriageway		Land Use		Terrain	Embankment/Cutting	Name of Village/Town	Location of Important Road crossing and Name of Cross-Road		Light Post	
LHS			RHS			LHS (m)	RHS (m)	LHS	RHS		Height (+/-) metres		Name of Village/Town	Location	Name of Crossing/Joining Road	LHS	RHS
Type	Existing Width (m)	Condition	Type	Existing Width (m)	Condition									(Chainage)		

Type of Footpath:		Condition of Footpath:			Land Use:				Terrain:			
EF	Earthen Footpath	G	Good		R	Residential	O	Open land		P	Plain	
SL	Slab Footpath	A	Average		C	Commercial	W	Water-bodies		R	Rolling	
CF	Concrete Footpath	P	Poor		A	Agricultural land	I	Industries		H	Hilly	
					In	Institutional	F	Forest				

Type of Carriageway			Type of Drainage:				Condition of Drain:			Type of Shoulder	
B	Bituminous Road		E	Earthen Drain		BL	Blocked beyond 50%		ES	Earthen Shoulder	
W	WBM Road		S	Stone Masonry Drain		DO	Drain damaged- one side wall to be re-constructed		PS	Paved Shoulder	
C	Concrete Road		C	Concrete Drain		DD	Drain damaged- both side wall to be re-constructed				
						GB	Good drain but blocked upto 50%				

Appendix 2600D

B: Format for Road Condition (As per Para 2602)

Public Works Department, Kerala State

Road Name: _____ Section: _____ Name of Official with Designation _____
 Type of Road: SH MDR ODR VR Road Number _____
 Division: _____ Sub- Division: _____
 Road Starts at (Location): _____ Starting Chainage: _____
 Road Ends at (Location): _____ Ending Chainage: _____ Date of Survey _____
 Road Length (km): _____

1	2	3	4	5	6	7	8	9	10	11	12	13
Chainage (km)		Global Position System (GPS) coordinates at Start Node*			Cracks					Rut Measured using 2m Straight Edge Along Wheel Paths		
		Map Datum: WGS 84										
From	To	Latitude (Deg. Min. Sec.)	Longitude (Deg. Min. Sec.)	Accuracy in Meters (if, available)	Type	Cracked Portion Width, mm	Total Length of Crack with width less than 3 mm	Total Length of Crack with width between 3-6 mm	Total Length of Crack with width greater than 6 mm	Average Rut Length, m measured longitudinally	Average Total Rut Width, mm	Average Rut Depth, mm (maximum)

14	15	16	17	18	19	20	21	22	23	24	
Patch			Rough Road		Asphalt Edge Breaks						
						LHS			RHS		
Total No. of Patches	Average Length, m	Average Width, m	Ravelled Width, m	Ravelled Length, m	Total Length, m	Average Width, m	Average Depth, mm	Total Length, m	Average Width, m	Average Depth, mm	

25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
Potholes				Texture	Shoulder Deficiency		Water Stagnation Problems		Geometric Details					
					LHS	RHS								
Number of Potholes	Average Width of Pothole, m	Average Length of Pothole, m	Average Depth of Pothole in cm	Quantity of sand spread in cc to form 30 cm diameter	Average Shoulder Drop, cm	Average Shoulder Drop, cm	Length, m	Average Width, m	Total Number of Curves	Number of Rise	Number of Fall	Camber on the Road	Camber on Curve	Average Elevation of the Road above mean sea level (using GPS)

* Note:
This data is required for integration with GIS based RIMS data

Type of Cracks:
A Alligator Cracks
L Longitudinal Cracks
T Transverse Cracks

Texture:
sand passing through 600 micron and retained on 300 micron sieve diameter of spread = 300 mm

Appendix 2600E

C. Inventory of Culverts (As per Para 2602)

Public Works Department, Kerala State

Type of Road:	Section:	Name of Official with Designation:
Type of Road: SH MDR ODR VR	Road Number	
Division:	Sub- Division:	
Road Starts at (Location):	Starting Chainage:	Date of Survey
Road Ends at (Location):	Ending Chainage:	Road Length (km):

1	2	3	4	5	6	7	8	9	10	11	12	13
		<i>Structure Details,</i>					<i>Superstructure, in m</i>		<i>Substructure</i>		<i>Foundation</i>	
Structure number	Chainage	Type	Nos	Width, m	Height, m	Depth of Slab in mm	Type	Material	Type	Material	Type	Material

14	15	16	17	18	19	20	21	22	23
<i>Wingwall</i>		<i>Railing</i>		<i>Parapet</i>		<i>Wearing course</i>			
Type	Material	Type	Material	Type	Material	Type	Thickness, mm	Carriageway Width, m	Average Elevation of the Road above MSL (using GPS)
PC- Pipe Culvert			BC- Box Culvert			SC- Slab Culvert			

Appendix 2600F

D: Condition of Culverts (As per Para 2602)

Road Name:	Section:	Name of Official with Designation:
Type of Road: SH MDR ODR VR	Road Number	
Division:	Sub- Division:	
Road Starts at (Location):	Starting Chainage:	Date of Survey
Road Ends at (Location):	Ending Chainage:	Road Length (km):

1	2	3	4	5	6	7	8	9	10		
		<i>Superstructure</i>			<i>Wearing Course</i>						
Structure number	Chainage	Pothole Area in m2	Reinforced Area Exposed, m2	Cracked Area in m2	Asphalt Edge Drops	Cracks in m2	Potholes m2	Average Depth of Potholes, mm	Average Patch area in m2		
11	12	13	14	15	16	17	18	19	20	21	
<i>Substructure</i>			<i>Foundation</i>			<i>Parapet</i>			<i>Desilting</i>		

Plastering area, m2	Masonry Construction, in m3	Pointing Area in m2	Plastering Area, m2	Masonry Construction, in m3	Pointing Area in m2	Plastering Area, m2	Masonry Construction, in m3	Pointing Area in m2	u/s Desilting in m3	d/s Desilting in m3
22	23	24	25	26	27	28	29	30	31	
<i>Deweeding</i>			<i>Miscellaneous</i>							
u/s Deweeding in m3	d/s Deweeding in m3	Dismantling CC in m3	Dismantling of masonry in m3	Laying of CC in m2	Laying of Skin Reinforcement in m2	Painting in m2	Fixing Guard Stones, nos	Backfilling Slopes using Earth, m3	Slope Protection Using Turfing for high embankments, m2	

Appendix 2600G

Abstract Particulars of Estimate for Maintenance & Repairs For The Year (As per Para 2602.1)

Name of Highway/ Road	Name of PWD Circle
Number of Highway/ Road	Name of Division
From (Place) To	Name of Subdivision
From (Chainage) To	Name of Section

BASIC ALLOWANCE & INCREMENT

- 1. Basic allowance.....(X)
- 2. Present demand.....(Y)
- 3. Increase (Y minus X).....(I)
- 4. Percentage (I x 100/X).....

Particulars	Length and width by types of pavement					(Total Kilometer)
	Earth	Gravel	W.B.M.	Black top	Cement Concrete	
Length x width (Kilometer) x (Meter)						
1	2	3	4	5	6	7

I RENEWALS PROGRAMME

Treatment proposed (symbols as explained)*	Width (meter)	Chainages to which this treatment has to be applied	Total length of each treatment (meters)	Rate of each treatment per 10 m ² Rs	Estimated cost of each treatment {col.2xcol4xcol5 R}	Remarks
1	2	3	4	5	10 6 (A)	7
Total =					(A)	

II- ORDINARY MAINTENANCE REPAIRS

II A. ROAD		II B. STRUCTURES	
1. Road gangs/ Labour cost		1. Buildings	
2. Materials for repairs		2. Minor bridges, Culverts and Drains	
3. Heavy berm repairs		3. Major bridges	
4. Arboriculture, signs and markings		4. Retaining walls, parapets, Drains etc	
5. Original works treated as repairs		5.	
	Total = Rs. (B)		Total = Rs. (C)
III. MISCELLANEOUS RECURRING CHARGES		IV. SPECIAL REPAIRS OUT OF CE'S RESERVE	
1. Ferry services		(To be entered by CE's office when he approves detailed estimates)	
2. Payment of rents		1	
3. Seasonal road construction in river beds		2	
4. Pontoon bridges		3	
5		4	
	Total = Rs (D)	5	

A+B+C+D =

Add 10% overhead charges =

Total of M&R Demand =

Rate per Kilometer =

* Renewal Specification Symbols

R (x) W. B. M. renewal: new layer thickness equivalent to x cm.

S₁ Light surface dressing, FIRST COAT on W. B. M. Surface.

S₂ Light surface dressing, SECOND COAT add also subsequent resurfacing coats

P (x) Premix Carpet, x cm thick.

G (x) Semi-grout x cm thick.

F.G. (x) Built-up spary grout x cm thick.

G.(x'') Spreading gravel x cm thick on gravelled roads.

Notes: 1. If any specification, not included above, is proposed, it should be described in the first column under RENEWALS.

2. The most common specifications have been given appropriate symbols above. In some cases the treatment suggested would be a simple one describable by one single symbol from the above list: some proposed treatment however might consist of two or more, specifications. These latter will be stated as under:

Example- 1. 4 cm premix carpet on 5 cm thick W. B. M. renewal course = R (5 cm) + P (4 cm)

2. Two surface dressing coats on 7.5cm thick W.B.M. renewal course = R(7.5 cm)+S₁ + S₂

General Explanations

1. **M. & R. Estimates:** Separate estimates will be sanctioned for each section of Road (Length lying, within a P. W. D. Division). Expenditure against each estimate will be booked under the heads I to III on reverse.

2. **Basic Allowance:** The basic allowance will be fixed from time to time. Until it is fixed, it shall be the actual average expenditure of the previous 5 years.

3. **Present Demand:** The demand of any year in the current quinquennium will consist of (i) the Basic Allowance of the previous quinquennium plus, if necessary a percentage allowance for growth of traffic, etc. Alternatively, if the surface is upgraded, the actual demand should be less than the Basic Allowance.

4. **C. E. 'S. Discretion:** Funds will be allotted to the respective divisions against the demands presented under the heads I to III of this form, without any detailed estimates being called for. Out of these funds, the portion representing the excess over the BASIC ALLOWANCE of each road will be held by the State C. E., the rest being passed on (through S. Es. to E Es). Against his reserve, the C. E. will approve repair works, which cannot be financed from within the BASIC ALLOWANCE, already passed on to the E. Es.

5. **C. E. 'S Reserve:** For extraordinary repair works arising out of flood or earthquake damage or required for extraordinary renewals and black topping programmes, the CE will have a reserve out of which he will allot funds against detailed estimates of works submitted to him. Entries under the head "IV SPECIAL REPAIRS out of CE 'S Reserve" will be made in the C. E. 'S office when he approves such estimates.

6. **General:** Estimated cost B+C) should not ordinarily exceed 50% of A. Where it does exceed, full reasons for the excess should be furnished. Otherwise the demand is likely to be suitably cut down.

Appendix 2600H

Road Chart for _____ Division for the year _____ (As per Para 2602.4.2)

Name of Road		Section																			
Classification		Subdivision																			
Kilometer		Renewals in previous years						Renewals in Current year						Proposals for Renewal (Next year)						Remarks	
From	to	Carriage way	Shoulder and side	Side drains	CD works	Road side Furniture	Encroachment	Carriage way	Shoulder and side	Side drains	CD works	Road side Furniture	Encroachment	Carriage way	Shoulder and side	Side drains	CD works	Road side Furniture	Encroachment		
0	1																				
1	2																				

Appendix 2600I

Schedule of Maintenance of Operations (As per para2602.5)

Item of maintenance	Apr il	Ma y	Jun e	Jul y	Aug ust	Septe mber	Octo ber	Nove mber	Dece mber	Janua ry	Febr uary	Ma rch
1	2	3	4	5	6	7	8	9	10	11	12	13
1. Through repairs including clearing of jungle growth sectioning & forming and clearing side drains	X	X	..	..	..	X	..	..	..	..	..	..
2. Clearing culverts and opening outlets	X	X	..	..	X	X	..	..	..	..	..	..
3. Filling erosions and removal of slips	As and when such or erosions occur											

4. Patchwork to metalled & graveled roads Do. Black topped	..	..	X	X	X	X	X	X	X	..	..	..
5. Watering and blinding metalled roads	X	X	..	..	..	..	..	..	X	X	X	X
6. Planting avenue Trees	..	..	..	X	X	..	..	..	..	..	..	..
7. Collection of metal for patchwork (metalled roads)	..	X	X	..	..	..	..	..	..	..	..	..
8. Collection of metal for renewal (metalled roads)	..	X	X	X	..	..	..	..	..	..	..	..
9. Collection of metal for renewal (BT Roads)	..	..	..	..	..	..	X	X	X	..	..	..
10. Repairs to pitching, retaining walls etc.	..	..	..	..	..	..	..	X	X	X	X	X
11. Painting sign boards, Kilometre stones, guard stones etc.	..	..	..	..	..	..	..	X	X	X	X	..
12. Painting steel bridges	..	..	..	..	..	..	..	X	X	X	X	X
13. General maintenance, unforeseen works	All the year round and according to necessity.											

Appendix 2600J
Register of avenue trees (As per Para 2604.1)
 As on.

Division..... Subdivision.....
 Section.....

Sl. No. of trees	Name of road Kilometre		Proceeding in the direction of		Species	Girth at 1 metre above ground level	Whether Revenue yielding or not	Remarks
			Left	Right				
1	2	3	4		5	6	7	8

- Note: - 1. Numbering should be done serially in every road in each kilometre in the direction of increasing kilometrage first on the left side and then on the right side.
 2. The number should be written or stenciled in black with figures 7 ½ cm. height after painting the background in white.

Appendix 2600K
ROAD CUTTING AND RESTORATION PROTOCOL (As per Para 2607)

1 Scope:

- 1.1 A road-opening permit is required for any digging, excavation or construction of any kind within a public right of way or that has an effect on the right of way. The road excavations by any person or authority or agency and its reinstatements there after shall strictly follow this Protocol.
- 1.2 A separate permit shall be required for each and every road opening. Excavation for appurtenances such as manholes, small head walls, cutoff walls, small vaults, valve boxes, catch basins, wall footings, etc. shall be deemed to be in the category of trench excavations.
- 1.3 Planting of poles for **electric**, telegraph, telephone, and any other cable carrying posts shall be in compliance with this protocol.
- 1.4 It shall be **unlawful** for any **person or authority or agency** intending to **construct, place, maintain or carry any cable, wire, pipe, drain, sewer, channel of any kind through, across, along, under, in or over any PWD road** to make an excavation in or disturb the surface of any PWD road without a **permit in writing from the Highway Authority**.

2 Definitions – In this protocol, unless the context otherwise requires,-

- 2.1 **Road:** The stretch where cutting and restoration has to be done.
- 2.2 **Applicant:** The department or individual who applies for the permit
- 2.3 **Permittee :** The Individual/ Department in whose name the permit is issued.
- 2.4 **Contractor:** The person who executes the work for the Permittee

3 General Regulations

- 3.1 Permits will be granted by the Highway Authority for all road openings from 1st November to 28th February every year at which time all excavation will be closed and patched, other than emergencies such as leakage of sewer lines, water lines, gas lines, disconnection of electric and telephone cables. The issuance of permits should be closed on 1st March every year
- 3.2 No road opening permit will be issued for a road that has been resurfaced within the past (three) 3 years, except in the case of an emergency. Request for exemption of this section must be made in writing to the Highway Authority and exemptions are granted only for new utility connections for the newly constructed buildings incase no such sources are available.
- 3.3 The formal application in prescribed format signed by any person or duly authorized officer of the authority or agency intending to construct utility, should be submitted to Highway Authority
- 3.4 Such requisition should be accompanied by proper alignment maps drawn to scale and the section of the trenches to be cut, the length of cuttings, the road crossings, and masonry structures such as manholes etc. should be clearly marked therein.
- 3.5 The applicant shall specify on the application the approximate date, the excavation is to be made and submit at least two months before the works intends to begin. Permits shall be issued 72 (seventy-two) hours before the work begins. The work shall not be started without 24 hours notice to the Assistant Engineer of the Department in charge of the Road.
- 3.6 In low intensity traffic areas all work is to be done between the hours of 8:00 am and 5.00 pm on week days.

- 3.7 In high intensity traffic areas, wherever possible work shall be done between the hours of 6:00 am and 3.00 pm on Saturday, Sunday or holidays.
- 3.8 However, openings are not permitted on Saturdays, Sundays or Holidays, that disrupts essential services, such as a water, gas or sewer system. These may be done at night time as per the discretion of the Highway Authority.
- 3.9 A permit to close the road to traffic will only be issued in the most unusual circumstances. Usually part of the road must be kept open to traffic at all times as specified in clause 6.1.3
- 3.10 Applicant/PWD is responsible for notifying any other local utilities/ public, which/ who may be affected namely Kerala Water Authority, BSNL and other communication networks, Kerala State electricity Board (KSEB) and public services like transport and the Public media.
- 3.11 On all matters pertaining to the interpretation of these regulations or to the quantity or quality of materials or workmanship called for by these regulations, the decision of the Highway Authority shall be final and binding.
- 3.12 In all other matters related to disputes between departments, the provision of GO(P)No.88/99/PWD dated 18.11.1999 will be valid.

4 Issuance of Permit

- 4.1 The Highway authority should verify the proposal, conduct a joint inspection if necessary, and prepare a detailed estimate for restoration works as per the standards. The work should not include any uprooting of trees.
- 4.2 The Highway Authority should direct the utilities to make use of any available ducts or channels provided for this purpose, especially along bridges and across roads or junctions.

4.3 Validity of permit

- 4.3.1 Permit shall be in effect for thirty (30) days from date of issue, however any opening should not be left unfilled for a period exceeding 48 hours. In case the work needs more than 30 days, it shall be at the discretion of Highway Authority.
- 4.3.2 The maximum length of open trench shall not exceed 200 m in the aggregate at any one location. Any excavated area shall be considered open trench until all pavement replacement has been done and compacted to specification. There shall be no open trenches left in the public right of way overnight. Trenches shall be backfilled or plated with steel plates and necessary warning devices shall be placed by the contractor to alert motorists of road conditions.
- 4.3.3 The holder of this permit or any of his designees or other persons, shall indemnify and save harmless against all claims for damages for injuries to persons or property, and against all costs, suits, expenses and losses occurred by anyone or anything related to the the conditions in this road opening permit..
- 4.3.4 On getting the sanction the utility organization shall execute a memorandum of understanding with the Highway Authority and follow the guidelines stipulated in GO(Rt)No.684/09/PWD dated 27.5.2009. (given in Appendix 2800N)

5 Contract Requirements

- 5.1.1 Contractor must provide evidence that he is qualified to do the work to the permitting authority. Past experience and necessary tools and plants shall be deemed sufficient. He also has to execute an agreement with the Highway authority to abide by the specifications for trenching , backfilling and temporary pavement.
- 5.1.2 All required traffic warning devices and signs, flagmen, lights, barricades, etc. will be furnished by the contractor and approved by the Highway Authority and/or his designee, in compliance with IRC SP 55, at no cost to the department.
- 5.1.3 All work will be performed in a professional manner that does not impede the flow of traffic. A Police patrol will be used in high traffic areas, as designated by the Highway Authority and Police, at no cost to the department. All emergency departments (Fire force Ambulance services, Police) must be notified by the contractor through the permittee of any work in a public way, which impede the smooth passage of emergency vehicles.
- 5.2 The contactor shall be entirely responsible for safeguarding and maintaining all conflicting utilities. This includes overhead wires and cables and their supporting poles whether they are inside or outside the open trench.
- 5.3 During trenching operations, the existing masonry structures and buildings on the roads, culverts, bridges, retaining walls and drains should not be tampered with. The contractor shall take all necessary precautions and shall be liable for any damage caused by the construction.
- 5.4 The contractor will be required to repair the permanent trench for a period of one (1) year.

5.5 The contractor will be responsible for all miscellaneous expenses. For no reason shall the Department be responsible for any costs incurred from any of the conditions of the road opening permit, including but not limited to, any costs related to any litigation related to this permit.

6 Procedure for Cuts

6.1 Excavations in the traveled way shall be cut in a straight line in accepted manner as approved by the Highway Authority and/or his designee that will cut full depth of the pavement.

6.1.1 Where trenches lie within Cement concrete section of streets, alleys driveways, sidewalks etc, such concrete shall be saw cut to neat vertical, true lines or in a method that the adjoining surface shall not be damaged.

6.1.2 Asphalt shall be cut in neat straight lines by means of an asphalt cutting wheel, milling machine or cutting saw. The excavation, manually or mechanically shall be between these lines and the sides shall be truly vertical.

6.1.3 If the excavation extends the full width of the road, only one-half of the road shall be opened, and this is to be properly backfilled before the other half is opened, so as to permit the free flow of traffic. In some cases it may be possible to open on each side of the road and jack or drive a pipe from one opening to the other. This should be done whenever possible.

6.1.4 Tunneling or mechanical methods of boring under the road for service installations may be permitted only on written approval of the Highway Authority, or his representatives.

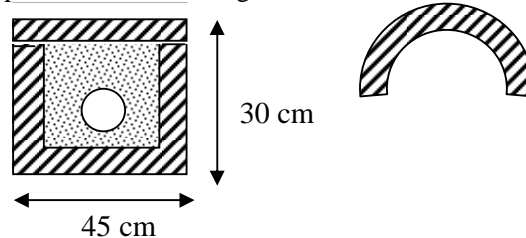
6.1.5 Excavated material suitable for backfilling shall be stockpiled in an orderly manner and unsuitable / excess material shall be disposed off suitably by the contractor. Excavated material will only be placed on the traveled way when it will not impede the flow of traffic.

7 Pipe/ cable laying:

7.1 The bottom of the trench shall be accurately graded to provide uniform bearing and support for each section of the pipe. Foundation and bedding for these underground facilities shall be native material, or sand or quarry dust, which conforms to the grading requirement of MoRTH for fine aggregate.

7.2 When backfill material consists of aggregate base course, crushed stone, or other material containing stones, only sand/ Quarry dust will be used for foundation and bedding. In case of PVC and other plastic type pipes the bedding shall invariably be of sand. The foundation depth below the pipe shall be 15cms and bedding depth shall be 30cms above the top of the facility.

7.3 Alternately a concrete rectangular open section of maximum width 45 cm could be used as bed and pipes/ cables placed over it. It shall be continuous true to lines and levels so as to form a channel. This shall then be sand filled and over it backfilling done. Semi circular concrete sections may also be used to cover these pipes before sand filling. Each cast block shall be about 60cms length.



7.4 If any utilities are exposed during excavation, i.e. Sewer, Water, Electric, etc., the appropriate department will be notified for the opportunity for an inspection prior to backfilling. In any case an inspection by the highway authority is mandatory.

8 Procedure for Backfilling

8.1 Backfilling will be done with excavated material unless otherwise directed by the Highway Authority. It shall be done, with flowable fill or mechanically compacted materials in 15cms lifts or jetted with water to within 5cms of pavement grade.

8.2 When material is placed on the traveled way, suitable arrangement shall be in place to sweep and keep the pavement clean and free of dust after backfilling each day.

8.3 Acceptable backfill material shall conform to clause 305 of MORTH. This does not preclude the use of excavated material which may meet these specifications. The Department reserves the right to test any and all backfill material prior to its use.

8.4 Backfill shall be deposited in layers not to exceed 20 cm in depth before compaction. Equipment to be used for compaction may include vibrating tampers of the mechanical or pneumatic type, impact type rammers or trench rollers or any other type of equipment, which will produce the required

degree of compaction. Rolling and compaction shall be done in the longitudinal direction of the trench.

8.5 If the moisture content of the soil is outside of the limits required for achieving 95 percent of maximum compaction the the addition of water or the use of drier soil so that the required degree of compaction will be achieved. Water consolidation by jetting of these layers shall be resorted to without causing any flooding, when compaction methods are not possible.

8.6 Exceptional cases In case of excavation greater than 1.5m, the in situ densities shall be taken and compaction done to achieve the same while backfilling upto 1.5 m depth. Top 1.5 m shall be done as per above specifications.

8.7 Temporary Pavement

8.7.1 The last 10 cm shall be a temporary bituminous/ concrete patch in case of trenches across or on the pavement. If pavement restoration is not to be made immediately, backfill shall be carried to the finished grade of the pavement, the final 10cm to consist of shoulder stone or approved equal.

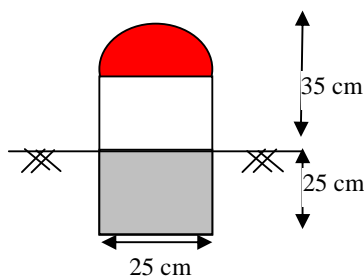
8.7.2 In case of trenches for domestic/ residential use, the top 10cm shall be of concrete after refilling and consolidation as specified earlier.

8.8 Driveways, sidewalks, street intersections, shoulders, lawns, shrubs, trees, signs and pavement markings shall be restored to conditions prior to construction, at no extra cost. No tree limbs, or brush will be cut without prior approval of the Highway Authority.

8.9 Reference markers

8.9.1 Reference markers shall be placed at every kilometer along the extreme side of the road indicating the type of utility, its horizontal distance from reference marker and depth from the pavement surface. Any deviations shall also be referenced.

8.9.2 The typical specification for such markers shall be as follows



(Not to scale)

8.10 At this stage the road shall be inspected by the highway authority and a certificate issued to the effect that the backfilling has been done as per specifications. Based on this certificate, the permittee may accord sanction for final payment.

9 Final Pavement

9.1 After completion of the work covered by this permit, there will be a surface overlay of bituminous concrete in case of pavements and shoulder restoration in case of side trenches..

9.2 The temporary bituminous patch as specified above is to be maintained for a minimum of thirty (30) days. Then the temporary patch shall be removed and a permanent patch shall be applied in accordance with MoRTH Specification for patch working.

9.2.1 In case of trenches along the road allow sub-grade to dry sufficiently, scarify, digout up to 30 cm on each side of the original cut, so that the patch is placed on undisturbed material when the permanent patch is applied. Wherever necessary, an additional base course has to be provided.

9.2.2 In case of trenches across roads, bituminous concrete laid to full width of the traveled way, and 3 meters both sides of the excavation at a minimum depth of 2-4 cm or at the discretion of the Highway authority. Any surface undulation shall be rectified prior to this work.

10 Emergencies In case of emergency repairs, localized in a point, telephonic intimation is a must. For this, the permit fee and application along with restoration fee has to be submitted within the next 2 working days.

11 Quality Checking

11.1 Quality checks shall be performed at mainly four stages by the highway authority or his designee

11.1.1 The cutting process- the cut should be in straight lines and true to plumb.

11.1.2 Bed laying- the bed should be level, free from undulations. Well graded material conforming to specifications must be used up to the prescribed level. In case of channel blocks, these must be continuous and true to lines and levels.

11.1.3 Backfilling- material should conform to specified standards, and compaction should achieve required density.

11.1.4 Pavement layer- should merge with the adjacent surface without causing bumps.

12 Shifting of Utilities

	Pavement	Shoulder
Length of Cut		
Size of Opening		
Type of (Material composition)		
Bituminous layer		
Metalled layer		

12.1 Whenever Telephone/Electric posts/pipe lines are to be shifted to facilitate widening of roads, the Executive Engineer concerned should forward a request to the concerned District Officer of the department for shifting.

12.2 District Officers of the department/organisation concerned should shift the utilities within four weeks of receipt of requisition and inform the Executive Engineer concerned about the completion of the work. After the lapse of prescribed time, Highway Authority may initiate necessary steps for removal of the same and the expenses incurred shall be levied from the concerned department.

12.3 Shifting of these utilities shall be done at the locations specified and directed by the highway Authority at the cost of concerned departments.

13 Penalty

13.1 Highway Protection Act clause 26 sub section (1) specifies the necessity for a permit and sub section (3) describes the fine to be collected for such trespassing.

13.2 Failure to obtain a permit or comply with the regulations in force shall be subject to a fine of 10(ten) times the estimated restoration charges plus the permit fee or the penalty specified under Clause 26 Sub section (3) of Highway Protection Act, whichever is greater.

Appendix 2600L

Form I

**GOVERNMENT OF KERALA
PUBLIC WORKS DEPARTMENT**

Application for Permit for Road Cutting (As per Para 2607)

Submitted to

Highway Authority , _____(Division)

Name of Applicant/ Utility : _____

Address with Contact Number : _____

Name of Road and location of cut : _____

Purpose of permit : _____

Details of road opening (Attach Alignment/Strip plan or sketch)

Name of Contractor : _____

Address with Contact number : _____

Estimated start date : _____

Completion Date : _____

Other Utilities to be intimated

KSEB

Kerala Water Authority

Police Department

BSNL/ Private Communication Networks

Others (Specify)

Signature of Applicant:
Place :
Date :

Appendix 2600M
Form II
GOVERNMENT OF KERALA
PUBLIC WORKS DEPARTMENT
Permit for Road Cutting (As per Para 2607)

Permit Number with date : _____
Issued by Highway Authority , _____ **(Division)**
Application From _____
_____ Dated _____ Received on _____ for the purpose
of _____ along/ across(Name of Road and
location of cut) _____ has been permitted to proceed with the
works as per the application subject to the Road Cutting and Restoration Protocol and the following
conditions.

Condition of Permit*

1. An Agreement has to be signed in the prescribed format between the Highway authority and the Contactor within 5 working days.
2. A Performance Bond has to be executed.
3. Intimation to the affected utilities department/ public
4. The prescribed restoration fee should be remitted in favor of the Department

* applicable to all utility departments

In case of Domestic/ residential applicants, only condition 4 is applicable

This permit is valid for 30 days from the date of issue

The holder of this permit or any of his designees or other persons, shall indemnify and save harmless against all claims for damages for injuries to persons or property, and against all costs, suits, expenses and losses occurred by anyone or anything related to the the conditions in this road opening permit. Any violation of the permit shall be liable for prosecution under the highway protection Act.

Signed : _____
Place : _____
Date : _____

Appendix 2600N
GOVERNMENT OF KERALA
Abstract

Public Works Department-Memorandum of Understanding between Public Works Department / Kerala Road Fund Board and Kerala Water Authority, Kerala State Urban Development Project etc for digging and restoration of roads – Orders issued

PUBLIC WORKS (H) DEPARTMENT

G.O (Rt) No.684/09/PWD

Dated, Thiruvananthapuram, 27/5/2009.

- Read: 1. Lr.No.15/CE (R&B)/RSW/2008 dated 31.12.2008 from the Chief Engineer, Roads & Bridges, Thiruvananthapuram
2. Note No.KSUDP/PMU/LSGD/PWD dated 5.2.2009 from the Project Director, KSUDP.
3. Lr No.TCRIP/1014/PE/08 dated 3.3.2009 from the Chief Engineer, KRFB.

ORDER

Various utility organizations like the Kerala Water Authority, Kerala State Urban Development Project, Kerala State Electricity Board, Bharat Sanchar Nigam Ltd. Etc often request permission from Public Works Department to cut open the roads for laying their water pipes, cables etc. Though the organizations remit the charges for restoration of the roads in advance to the PWD, most of the time the restoration works are not promptly carried out.

2. In many cases, apart from the obstruction caused to traffic during the execution of work for laying the utilities, the dug locations remain as chronic trouble spots long after the work are completed. The digging agencies generally neglect to compact the loose earth which is filled back into the trenches and as a result earth is left surplus in the form of mounds over the dug spots. This also causes various kinds of hindrances of traffic.

3. With a view to mitigate such hardships to the road users, Government have decided that henceforth the organizations which request permission for cutting the roads themselves shall restore the road to its original condition within a stipulated time under supervision of PWD. A memorandum of understanding in the format appended shall be got executed by all the organizations before digging the roads and the terms and conditions mentioned therein shall, strictly be adhered to by all concerned.

By Order of the Governor,

TOM JOSE
Principal Secretary to Government

To

The Chief Engineer, Kerala Road Fund Board, Mayoora, Belhaven Garden, Kowdiar,
Thiruvananthapuram
The Chief Engineer, Roads & Bridges, PWD, Thiruvananthapuram
The Chief Engineer, National Highways, PWD, Thiruvananthapuram

The Chief Engineer, KSTP, PWD, Thiruvananthapuram
The Chief Engineer, Kerala Water Authority, Thiruvananthapuram
The Chief Engineer, JBIC assisted Water Supply Project, Water Works Campus,
Thiruvananthapuram
The Chief Engineer, Irrigation, Thiruvananthapuram
The Chief Engineer, KSEB, Thiruvananthapuram
The Chief General Manager, BSNL, Thiruvananthapuram
The Project Director, KSUDP, 5th Floor, Trans Towers, Vazhuthacaud,
Thiruvananthapuram
The Chief Engineer, Local Self Government Department
The Executive Engineer, Road Safety Cell, Office of the Chief Engineer, PWD,
Thiruvananthapuram

Copy to:

Water Resources Department
Local Selft Government
The Director, Informational and Public Relations Department
Stock File / O. C

**MoU TO BE EXECUTED BETWEEN THE PWD / KRFB AND THE KERALA
WATER AUTHORITY / KSUDP FOR.....WORKS ON PWD / KRFB
ROADS**

MoU executed on thisday of.....Two
Thousand.....BETWEEN.....hereinafter
called the Requisitioning Authority on one part and the Executive Engineer, Public
Works Department / Project Engineer, KRFB hereinafter called “the PWD / KRFB” on
the other part.

Whereas the Requisitioning Authority wants the
work.....to be carried out on the
“.....” road under the PWD/KRFB which involves the
excavation of either or whole or part of the length of the said road, to the width and depth
mentioned in the schedule attached to this agreement, and the Requisitioning Authority
has requested the PWD / KRFB to accord sanction to carry out the work in accordance
with the time table given in the schedule to this agreement.

AND WHEREAS the PWD / KRFB has issued formal sanction to the Requisitioning
Authority to commence the work vide proceedings attached to this agreement.

It is mutually agreed as follows:

The Public Works Department / KRFB agrees to hand over the roaes under its
jurisdiction to the Requisitioning Authority for carrying out the works mentioned in
the schedule and the later agrees to return the road after the works restored to its
original condition as per the terms and conditions mentioned below:

Terms and Conditions

- (1) The Requisitioning Authority will identify the roads to be taken up for the works
and make a formal request to the respective Executive Engineer, PWD / Project
Engineer, KRFB along with the schedule of implementation of their works and

restoration works of the road at least two months in advance of the proposed date of starting of the works.

- (2) Such requisition should be accompanied by proper alignment maps drawn to scale, section of the trenches to be cut, length of cuttings and crossings, masonry structure such a manholes, culverts, bridges, etc clearly marked therein.
- (3) Detailed schedule specifying the date of commencement and date of completion of trenching, laying pipe lines or cables as the case may be, testing, back filling including dates of completion of each stage of the rectification of road works will be forwarded to PWD/KRFB by the Requisitioning Authority.
- (4) Based on the list and the schedule, the Executive Engineer, PWD / Project Engineer, KRFB will issue the required permission for the use of the roads for the said works or refuse permission indicating the reason thereof within 15 days of receipt of formal request.
- (5) The estimate for rectification or road will be prepared by the implementing agency with provisions required for restoring the road to its original position as per IRC / MORTH specification and site condition and will be forwarded to Executive Engineer / Project Engineer for approval.
- (6) All works and restoration works on the road including compacting and black topping should be completed within 15 days from the date of sanction. Beyond 15 days, a fine of Rs.1 lakh will be imposed for each day of delay. If the Requisitioning Authority fails to remit the penalty amount further trenching will be stopped by PWD / KRFB. If the PWD / KRFB feel that the work is not progressing according to schedule, the Executive Engineer, PWD / Project Engineer, KRFB may call a meeting with the Requisitioning Authority for reviewing /monitoring the progress of work.
- (7) Pipes and other construction materials shall be stacked at site only in consultation with the Executive Engineer concerned and will not be stacked more than 5 days before commencement of the work. The excess cut soil, boulders, rubbles, balance pipes / cables should be removed from the site at the cost of the Requisitioning Authority immediately after back filling is completed, at any rate within 48 hours o completion of works.
- (8) Works should be carried out causing minimum hindrance to traffic and inconvenience to the public. In cases where traffic is not blocked, trenching, pipe laying, back filling and rectification are to be done simultaneously.
- (9) Pipes should be laid at a minimum depth of 1.2 metres or as prescribed by the Executive Engineer, PWD or Project Engineer, KRFB which ever is deeper.
- (10) The guarantee period for the rectification work will be six months and the Requisitioning Authority will be responsible for rectifying the damages on the road surface during the guarantee period. If there is any failure on the part of Requisitioning Authority, PWD will arrange the work at the cost of the Requisitioning Authority.
- (11) If any occurs to other portions of the same road due to laying of pipe or cable work which were not anticipated during the preparation of estimate for restoration of the road, the same shall also be rectified by the Requisitioning Authority at its cost.
- (11) a. The trenches taken for laying pipes shall be filled up with sand 15 cm above the pipes.

- (12) Proper lighting, fencing, caution boards and other precautionary measures as per 'I.R.C S.P 552001 – Guidelines on safety in road construction zone' should be ensured by the Requisitioning Authority in order to avoid any kind of accidents and the Requisitioning Agency will be solely responsible for any accident or damage caused during the execution of the works or during the guarantee period. The Requisitioning Authority shall be liable to pay a penalty of Rs.5,000/- per day for not providing adequate safety measures on receipt of notice from the Executive Engineer PWD / Project Engineer, KRFB.
- (13) If any damage is caused to the utility services of other agencies during work, the complete cost for rectifying the damages are to be borne by the Requisitioning Agency.
- (14) The Requisitioning Agency should re-lay / shift their utilities such as pipes, cables etc. as and when requested by PWD / KRFB for road widening and for other purposes at their own cost without claiming any charges form PWD / KRFB and within the stipulated time.

If any retrenching is to be done for rectification of joints / leakages etc. restoration of the road to its original condition should be arranged on the same day itself

Appendix 2700A

**A: Bridge Register (As per Para 2702)
Public Works Department, Kerala State**

Road Name: _____ Section: _____ Name of Official with Designation: _____
 Type of Road: **SH** **MDR** **ODR** **VR** Road Number _____
 Division: _____ Sub- Division: _____
 Road Starts at (Location): _____ Starting Chainage: _____
 Road Ends at (Location): _____ Ending Chainage: _____ Date of Survey _____
 Road Length (km): _____

1	2	3	4	5	6	7	8	9	10	11
Structure						Superstructure			Substructure	
Structure number	Chainage	River Name	Number of Spans	Clear Span in m	Length of Bridge, m	Type	Material	Thickness	Type of Abutment	Type of Pier

12	13	14	15	16	17	18	19	20	21	22	23
Foundation		Wingwall		Railing		Parapet		Wearing Course			Average Elevation of the Bridge above MSL (using GPS)
Type	Material	Type	Material	Type	Material	Type	Material	Type	Thickness, mm	Carriageway Width, m	

Appendix 2700B
B Condition of Bridges (As per Para 2702)
Public Works Department, Kerala State

Road Name:
 Type of Road:

SH	MDR	ODR	VR
----	-----	-----	----

Division:
 Road Starts at (Location):
 Road Ends at (Location):

Section:
 Road Number
 Sub- Division:
 Starting Chainage:
 Ending Chainage:

Name of Official with Designation:
 Date of Survey
 Road Length (km):

1	2	3	4	5	6	7	8	9	10		
<i>Superstructure</i>					<i>Wearing Course</i>						
Structure number	Chainage	Pothole area in m2	Reinforc-ed area exposed, m2	Cracked area in m2	Asphalt edge Drops	Cracks in m2	Potholes m2	Average depth of potholes, mm	Average patch area in m2		
11	12	13	14	15	16	17	18	19	20	21	
<i>Substructure</i>			<i>Foundation</i>			<i>Parapet</i>			<i>Desilting</i>		
Plastering area, m2	masonry construction, in m3	Pointing area in m2	Plastering area, m2	masonry construction, in m3	Pointing area in m2	Plastering area, m2	masonry construction, in m3	Pointing area in m2	u/s desilting in m3	d/s desilting in m3	
22	23	24	25	26	27	28	29	30	31	32	
<i>Deweeding</i>		<i>Miscellaneous</i>									
u/s deweeding in m3	d/s deweeding in m3	Dismantling CC in m3	Dismantling of masonry in m3	Laying of CC in m2	Laying of Skin Reinforcement in m2	Painting in m2	Fixing guard stones, nos	Backfilling Slopes using Earth, m3	Slope Protection Using Turfing for high embankments, m2	Number of lighting to be improved	

Appendix 2700 C

Inspection Report of Bridges (As per Para 2703.1)

Sl.No

(1) General Particulars

- a. Name of Bridge, type of Bridge(High level/submersible).
- b. Name of river
- c. Name of highway, Bridge number, chainage
- d. Locality

(2) Last inspection by ----- on ----- date.

(3) Traffic Intensity PC U / T per
day

(4) Condition of

- a. Approaches
- b. Protective works (Pitching, apron, toes, floor, guide bunds)

(5) Waterway

- a. Adequacy
- b. Scour
- c. Obstruction
- d. Under growth
- e. Channel revetments
- f. Shifting
- g. Other features and remarks if any

(6) Foundation and Substructure (Masonry, Timber, Steel or concrete)

- a. Under mining/ scour
- b. Settlement
- c. Cracking
- d. Disintegration
- e. Decay
- f. Corrosion
- g. Filling foundation
- h. Tilting
- i. Cavitation
- j. Growth of vegetation
- k. Other defects/damages and remarks if any

(7) Bearings

- a. Condition
- b. Movement
- c. Deformation
- d. Cleanliness
- e. Condition of grease

(8) Super Structure

- i. Concrete (RCC and PSC)
 - a. Cracking
 - b. Scaling
 - c. Scour
 - d. Deflection/ Settlement
 - e. Disintegration
 - f. Bulging
 - g. Tilting
 - h. Water proofing
 - i. Leaching
 - j. steins
 - k. Spalling
 - l. Condition of articulation

- m. Condition of inside box in case of PSC
 - n. Other defects/damages and remarks if any
 - ii. Steel Construction
 - a. Condition of protective system (paint/ epoxy / anodic etc.)
 - b. Corrosion
 - c. Deformation
 - d. Joints
 - e. Rivet and Weld condition
 - f. Buckling and Kinking
 - g. Waviness
 - h. Fracture
 - i. Cleanliness
 - j. Camber
 - k. End shoes
 - l. Other defects/damages and remarks if any
 - iii. Timber Span & Floor
 - a. Condition of paint
 - b. Decay/Rot
 - c. Wear (floor)
 - d. Structural defects
 - e. Crushing at joints
 - f. Splicers
 - g. Other defects/damages and remarks if any
 - iv. Masonry arches
 - a. Condition of Joints
 - b. Cracks
 - c. Vegetation growth
 - d. Bulging of spandrel walls and parapets
 - e. Deformation
 - f. Other defects/damages and remarks if any
- (9) Miscellaneous
- a. Wearing course(Surface condition and drainage)
 - b. Drainage (Spouts, vent holes, clogging and cleanliness)
 - c. Parapet and handrails etc.- condition and profile
 - d. Footpath (Condition and drainage)
 - e. Expansion Joints(Cleanliness, wearing out and alignment, gap width, Hump, drainage, deformation, corrosion, cracks.
 - f. Utilities, (state condition)
- (10) Have actions been taken on the observations and recommendations from the last routine/ principle inspection.
- (11) Proposal for Remedial Measures
- a. Details
 - b. Approximate amount
- (12) General Remarks
-
- (13) Name designation and dated Signature
- of inspecting officer
- (14) Name designation and dated Signature
- of Reviewing officer
(Next Higher Authority of Inspecting Officer)
-

Note: (i) All columns appropriate to the bridge should be filled up by the Inspecting Officer.
 (ii) The condition of the particular part or parts of the structure detailed above should be generally described as “good” ‘fair’ or ‘deteriorated’ as may be considered suitable by the Inspecting Officer
 (iii) where there are special damages or dangerous developments noted these should be specially mentioned in the column “other remarks” pertaining to the concerned part of the structure.

- (iv) If the officer who is inspecting is unable to suggest proposals for remedial measures or finds it difficult to work out the appropriate cost, the inspection report should not be delayed on the account. The report should be sent without filling these columns, but with a letter explaining why he is unable to do so.

Appendix 2800A

Building Register (As per Para

2800.1.3)

Register of Buildings under the maintenance of Division

Brief particulars of buildings and land						Nature of Construction						
Sl. No.	Name of building	Location & Sy No.	Land extent	No. of stories	Plinth area GF	I Floor	II Floor	III Floor	Total	Walls	Roof	Floor
1	2	3	4	5	6	7	8	9	10	11	12	13

No. of electrified points				Water Supply					
Lights	Fans	Plug Points	Power Plugs	wash basin	Closets and other fittings	Years of construction	Value	Maintenance grant and sanction NO. and Date	Remarks (here enter reference to alterations and addition)
14	15	16	17	18	19	20	21	22	23

N.B. – Out houses may be given subsidiary numbers and details furnished as above.

Appendix 2800B

Rules for reservation, occupation etc of Rest Houses , Inspection Bungalows, and Camp Sheds.

- 1 **Short Title** : These rules may be called the Kerala Rest House occupation rules.
 - 2 **Extent** : They shall apply to all Rest House, Inspection Bungalows, and Camp Sheds under the control of Public Works Departments throughout Kerala
 - 3 **Definitions** :
 - a) Building means Rest House Inspection Bungalows or Camp sheds as the case may be.
 - b) Controlling authority means the Chief Engineer (Buildings) or any authority subordinate to him who is so authorized by him or any authority authorized by Government by an order.
 - c) Day means a whole day of 24 hours calculated from the hour of arrival for the occupation.
 - d) Government means of Government of Kerala
 - e) Officer in charge means a manager, steward, caretaker or watchman as the case may be who is authorized to be in charge of the building
 - f) Reserving Authority means Executive Engineer of the Buildings Division concerned or any authority so empowered by an order of Government.
 - g) Custodian Officer - The Assistant Engineer in charge of the building is the custodian officer.
4. **Reservation of Accommodation, Period of Occupation, Procedures of allotment etc.**
- i. Accommodation in the building may be reserved for a period of 3 days at a time for members of general public and 10 days for government servants on official duty on formal application affixing a court fee stamp for a value of Rs. 5/- to the reserving authority at least 7 days in advance. The reserving authority shall intimate the availability or otherwise of reservation to the applicant as well as the officer in charge of the building. Employees of this State, Central and other State

Governments, members of Parliament, and members of Legislative Assembly of the State are exempted from payment of reservation fees. In the case of request for reservation from outside the State and telegraphic requests, intimation regarding the availability of reservation shall be given only if they are reply paid. In the case of persons applying for reservation from outside the State Reservation fee shall be sent by M.O along with application for reservation.

- ii. The full amount of occupation fees for the entire period of reservation shall be paid in advance to the officer in charge of the building before the room is occupied. In case of extension of reservation, the full fee for the extended period of reservation shall be paid in advance before the commencement of the period of extension. No refund of the full or part of the fee paid shall be made except under sub rule (v) this rule or when for any reason not due to the fault of the occupant if they are not allowed occupation for the full period reservation. Under no circumstances reservation fee paid shall be refunded.
- iii. Reservation shall not ordinarily be made for more than 3 days at a stretch except I n the case of Ministers and Government Servants on official duty. In exceptional cases the Reserving authorities are empowered to sanction up to a maximum period of thirty days. Reservation of accommodation for periods over thirty days shall be sanctioned by Government.
- iv. The allotment shall be made in the order of priority of applications and the order of precedence. The Reserving authority shall communicate the order of reservation to the applicant as well as to the officer in charge of the building.
- v. If it is not possible to reserve accommodation the advance fee shall be refunded. In any case the advance fee to be refunded as to be sent by money order, the money order charges shall be met from the advance fee and only the balance amount shall be sent to the party. But fee shall not be refunded if accommodation is reserved and paid for but not utilized without prior intimation.
- vi. If the party does not required the accommodation already reserved for the entire period and given intimation to that effect to the Reserving authority or the officer in charge of the building at least 25 hours in advance they need pay rent for the actual period of occupation.
Note: If the officer in charge of the building received such a communication he shall immediately intimate the fact the Reserving Authority.
- vii. The Reserving Authority is competent to cancel the reservation once made without giving any reason whatsoever.
- viii. If the person who reserved the rooms does turn up within six hours on the first day of Reservation to occupy the rooms, the allotment of such rooms can be made by the Officer in charge of the building according of priority of applications and the order of precedence.
- ix. Those who do not reserve accommodation may be allowed to occupy a room in a building if it is available on arrival and not reserved for anybody under proper authority. In such cases the occupation in full for period of occupation shall be paid in advance before the commencement of occupation.

5. Rate of rent, number of persons in room, concession to Government servants etc.

(1) Rates for occupation of a room in the building are given below.

Category	Single Room(Rs)	Double Room(Rs)	Addl.Bed(Rs)	Extra for Air condition
Rest House in Corporation area	300	600	100	200
Rest House/TB in other District Headquarters.	250	500	100	200
Rest House/TB in Municipal Taluk Headquarters.	200	250	100	200
Other places	150	200	100	200
Conference Hall				
(a) Up to 60sqm	1500	1500	1500	1000
(b) Above 60sqm	3000		3000 3000	1000

- Note: (i) The number of additional bed referred above shall be limited to the maximum to three persons per room. There will be no charge for children below the age of 12 if no separate bed is used.
- (ii) Generally inspection Bungalows and camp sheds are intended for the occupation of Government servants on official duty. The rooms in these bungalows may be let out to others also when available at the rate of rooms mentioned above.
- (2) For Government official including central and other State Government of officials on duty are eligible for allotment of room at 1/3 rd DA on official duty. Government servants on private duty is eligible for accommodation at 50% rate as above. For conference hall on Government purpose is eligible at 50% rate as above. Whenever Government officers occupy Traveler's Bungalow or Rest House or Inspection Bungalows or Camp sheds in connection with any official duty, they shall note their salary in the occupation register to claim the benefit of this concession.
- (3) Members of general public need pay only the ordinary rate of rent for the first three days of their occupation of the building. For occupation for period in excess of 3 days the fee shall be double the ordinary rate.
- (4) Government employees on official duty can occupy the building at the concessional rate admissible to them for the first ten days of their continuous stay. For occupation for period in excess of ten days, the fee shall be double the concessional rate admissible to them.
- (5) If a room is occupied by more than one Government employee on official duty, such employees shall record their name and other particulars in the Register maintained for the purpose and rent at the prescribed rate is realigable from each employee.
- (6) Concession to certain categories:- (1) Employees of the Kerala State Electricity Board who occupy the buildings in connection with any official duty need pay only the concessional rate of rent applicable to Government servants.
- (2) Members of the Parliament and Members of the Legislative Assembly of this State, IAS/IPS probationer undergoing Training in the state are allowed the same concessions which are allowed to first class Government officers in the matter of occupation of the building. The accredited press correspondents in the State shall also be entitled to this concession on production of Accreditation card. However in the case of Accredited Press Representative of the District Head Quarters, concessions shall be limited to the Rest House/Traveler's Bungalow etc in the District.
- (3) The employee of the Central Government and other State Governments who occupy the buildings in connection with any official duty are also treated on a par with employees of the State.
- (4) The officers mentioned under sub rule (1), (2) and (3) shall produce necessary identity card in the form given in Appendix – I to the Reserving Authority or the officer in charge of the building in order to get the benefit of the concession.
7. Order of precedence:- (1) Order of precedence for the use of the building shall be is appended to this chapter:
- (2) If a particular building is required for the Governor and his party subsequent to the reservation of it to any other member of the different categories mentioned above, such reservation shall automatically stand cancelled and the officers occupying it shall vacate if forthwith on receiving intimation of reservation to the Governor and party. The occupation of the buildings by the Governor and Members of his family shall be free of charge.
8. Safes of articles and installations in the building and penalty for damages caused:- (1) A list of articles available in each room showing the value of each shall be kept in each room.
- (2) Persons occupying the rooms are expected to exercise the consideration and care for the rooms and furniture and any defacing of the walls or without damage to or spoiling of the furniture shall render the occupant liable to expulsion from the building besides payment of damage assessed by the controlling Authority. The officer in charge of the building shall bring to the notice of the Controlling Authority in this behalf any damages to fixing the cost of advantage.
- (3) The occupant shall bring to the notice of the officer in charge of the building any damage of fault noticed during his occupation. Subsequent complaints shall not be entertained.
- (4) The full value of the articles damaged or broken by the occupant or his servant shall be realized in cash from the occupant before vacating the room. The amount so paid shall be entered in the remarks column of the Register.
9. Payment of duties:- The bills of the Traveler's Bungalow preferred and signed by the officer in charge shall be paid in cash on presentation. Under no circumstances occupants may leave or cause their luggage's be moved from the Traveler's Bungalow before all accounts are finally settled.

10. Electric lights and fans – The residence shall arrange switch off lights and fans in the room when not required or when absence from their rooms.

11. Electric Gadgets or contravenes – No electric appliances other than those supplied (ie, table fans table lamps etc) may be fitted for operation in the rooms without first informing the officer-in-charge of the building in writing and obtaining his permission in writing. Additional use of electric power shall be charged for as extra in accordance with the estimated consumption of electric energy.

12. Radios & Musical instruments or any other musical or music instruments shall not be played after 10.0’ clock at night and even when played shall not create disturbance to the occupants in the same building.

13. Infections Diseases – Visitors who are suffering from infection diseases shall not be given accommodation or serve meals in the building. If any resident gets an attack of any infection diseases, he shall inform the fact to other officer-in-charge of the building so that necessary steps for assistance may be taken immediately.

Note: - In such cases the officer-in-charge of the building shall immediately render whatever help he can in the matter.

14. Safety of Money and Valuable articles – Occupants shall not keep any articles of value or money carelessly in their rooms but keep all such articles under lock and key. The Government shall not be responsible for any losing cases theft or damage done to the occupants property in case of accident or fire or through any other cause.

15. Maintenance of accounts, issue of receipts etc – The officer in charge of the building shall keep the accounts of the incomes received b y them from the buildings properly. The officer-in-charge of the building should issue proper printed receipts for each and every amount received by them. If there is any refund, the acknowledgement of the party and the amount refunded shall be got entered in the occupation register. Special fees pay able if any shall also be entered in the occupation register.

(8) Holding of conferences, reminders, meetings etc in the building other than designed conference hall shall not be permitted.

(9) A list showing the names and designation of the servants posted in the building shall be placed in a conspicuous place for the information of the occupants.

(10) The rooms of the building shall be numbered and the details regarding occupants in each room shall be displayed in a convenient place for the information of the travelers, the details regarding the vacant rooms, if any, shall also be so displayed.

(11) The occupation of the buildings by the Ministers of the Central Government when they visit the state on duty and the Ministers and speaker of the state while n tour or public business shall be free of rent.

(12) One room in all class II traveler’s Bungalow with six rooms and above and which are far away from Inspection Bungalow shall be kept exclusively under the control of the Executive Engineer (Buildings and Roads)concerned for the use of the PWD officers on official tour. This room shall also be made available to the officers of other Departments or the public when not required by the PWD officers. The power of reservation of this room shall rest with the Executive Engineer (Building and Roads) concerned.

(13) No dealers or their representatives are allowed to peddle their way or enter any residential or public rooms in the buildings.

(14) The rate of rent and other charges applicable to the building shall be displayed in each building in a conspicuous place for the information of the traveler’s.

(15) A copy of these rules shall be kept in each building for the information of the occupant.

(16) Notwithstanding anything contained n these rules, the Reserving authority shall have powers to reserve the building for any person cancel the reservation once made and also to direct the occupant to vacate at any time without giving any reason what to ever.

17. Rest house can be allotted for film shooting under prior approval from the reserving authority on the following charges.

Class I Rest House	- Rs.25000/- per day
Class II Rest House	-Rs.15000/- per day
Others	- Rs.10000/- per day

18. General – (1) Servants quarters shall be provided if available and their accommodation shall be charged for at Rs.1 for each person per day.

(2) Every occupier of a building on entry is required to write his full name and address in a register kept for the purpose in the building. He shall specify the number of persons occupying the room

and their family relationship with the occupant. The date and time of arrival, time of departure, the total amount paid by him etc, shall also be written. He shall also sign this register as an indication that he is willing to abide by these rules.

Note: The Controlling Authority shall maintain a Register providing columns for the above and for other items if any in each building.

(3) No articles shall be removed from the buildings except under the orders of the Controlling Authority, not shall the building be occupied by any persons other than bona fide -traveler's.

(4) The articles provided in a room shall not be removed to other rooms for the convenience of the occupants.

(5) A suggestion book shall be maintained in every building for the occupants to write their complaints if any and suggestions and recommendations etc. for the better working of the Traveler's Bungalow. The controlling authority shall arrange to have these suggestions examined and important points brought to the notice of the Government for orders, at least once a year.

(6) Government Servants attached to the buildings are forbidden from asking for tips from the occupants. Servant found asking for tips shall be liable for punishment in any conveyance to the occupants by the act of Government servant attached to the building should be brought to the notice of the controlling authority and remedy sought for.

(7) No registration from the occupants or visitors for the re arrangement furniture, carpets etc in the rooms shall be entertained.

(19) Catering charges: - Charges for catering if any, provided in the building and the share of the receipts creditable to Government shall be at the rates prescribed by Government, for the Guest House and Tourist Bungalows under the control of the Tourist Department from time to time. Bills shall be issued by the caretakers in the prescribed form.

(20) Inspection Bungalows and Camp Sheds:- (1) The inspection Bungalows and camp sheds in the stare are primarily intended for the use of Government officers travelling on duty and hence they have at all times preferential claim for their occupation. The Inspection Bungalows and camp sheds are under the administrative control of PWD and its allotment shall be made by the Executive Engineer concerned. Since the Inspection Bungalows and camp sheds are manly intended for the occupation of Government servants on official duty they may occupy the buildings without limit of time and have them, if need be reserved in advance. The Ten days rules preferred to join sub rule (1) of rule 4 in there form not applicable in the case of Government servants occupying inspection Bungalows and camp sheds on official duty.

The rate of rent applicable to Inspection Bungalow and camp sheds has be as shown under sub-rule (1) of rule 5.

(21) The rules 1-18 above are applicable in the case of Inspection Bungalows and camp sheds also subject to the preference to Government servant referred to in sub-rule (1) of this rule.

(22) Correction or modification if any, to these rules may be brought to the notice of Government for appropriate action.

(23) A list of Traveler's Bungalows Class II Inspection Bungalows and Camp sheds is given in Appendix – II.

Appendix I Identity Card

Name:

Designation:

Official Address:

Rate of Monthly Statement:

ORDER OF PRECEDENCE AT STATE FUNCTIONS

GOVERNMENT OF KERALA
General Administration (Political) Department

NOTIFICATION

No. 66398/Pol. 1/95/GAD

Thiruvananthapuram, 23rd January, 1996

The Order of Precedence to be observed at all State functions is redrawn and published below for information.

ORDER OF PRECEDENCE

Article of the warrant	Name of the Post
4.	Governor
5.	Former Presidents of India
6.	Chief Justice of India Speaker Lok Sabha
7.	Cabinet Ministers of the Union Chief Minister
7A.	Holders of Bharat Retna Decoration.
8.	Chief Ministers of States outside their respective States. Governors of States outside their respective States.
9.	Judges of the Supreme Court.
10.	Deputy Chairman; Rajya Sabha Deputy Chief Minister Ministers of State of the Union.
14.	Speaker of the Legislative Assembly. Chief Justice of the High Court.
15.	Cabinet Ministers of the State Government Chief Government whip. Deputy Ministers of the Union Government. Leader of the Opposition.
17.	Judges of the High Court. Chairman, Kerala Public Men's Corruption (Investigations and Inquiries) Commission. President, State Consumer Protection Commission Chairman, Kerala State Commission for Backward Classes
18.	Deputy Speaker, Legislative Assembly Mayor
21A	Members of Parliament.
21B	Members of the Legislative Assembly.

23. Chief Secretary to Government.
 Army Commanders/Vice Chief of Army Staff or equivalent in other service
 Flag Officer Commanding in Chief, Southern
 Navar Command. Officers of the rank of Lt. General or equivalent rank.
 Members of the Kerala Public Men's Corruption
 (Investigations and Inquiries) Commission.
 Members of the Kerala State Commission for Backward Classes.
 Officers in the rank of Chief Secretary
 Vice Chairman, State Planning Board.
25. Advocate General
 Chairman and Members of the Kerala Public Service Commission.
 Commissioners and Secretaries to Government.
 Director General of Police.
 First Member, Board of Revenue
 Officers of the Rank of the Director General of Police.
 Vice Chancellors
 Members of the Income Tax Appellate Tribunal, Kochi
 Lt. Governors of Union Territories visiting the State.
 Presidents of District Panchayats within their Jurisdiction.
 Principal Chief Conservator of Forests.
26. Accountant General.
 Chief Conservator Forests
 Collector of Customs and Central Excise.
 Commissioner of Income Tax.
 Director, Vikram Sarabhai Space Centre.
 General Manager, Telecommunications.
 Inspector General of Police and Officers of the rank of Inspector General
 of Police.
 Major Generals or Officers of equivalent rank.
 Members, Board of Revenue.
 Post Master General.
 Secretary to Governor.
 Secretaries, to Government and Members of IAS on super time scale.
 Secretary, Legislative Assembly.
27. Chairman of Statutory Corporations.
 Special Secretaries to Government.
 District Collectors within their jurisdiction.
 District and Sessions Judges within their jurisdiction
28. Brigadier in command of a Brigade and officers of equivalent rank.
 D.I.G. of Police.
 Major Heads of Departments.
 Managing Directors of Statutory Corporations.
 Additional Secretaries to Government.
 Conservators of Forests.
 District Collectors outside their jurisdiction.
 District and Sessions judges outside their jurisdiction.
 Judicial Officers of the rank of District Judges.

29. Chief Judicial Magistrates and Sub judges within their jurisdiction.
Heads of Medium Departments.
Joint Secretaries to Government.
Superintendents of Police within their jurisdiction.
30. Chief Judicial Magistrates and Sub judges outside their jurisdiction.
Deputy Secretaries to Government.
Heads of Minor Departments.
Officers in the senior scale of All India Services.

- Notes**
1. The order in this Table of Precedence is meant for State and ceremonial occasions and has no application in the day-to-day business of Government.
 2. Persons in the order of Precedence will take rank in the order of the number of articles. persons included in the same article will take precedence interse according to the date of entry into that Article.
 3. In Article 7, the Chief Minister concerned will take precedence over Cabinet Ministers of the Union in official functions held in the State.
 4. In Article 8 Governors of States outside their respective States will enblock rak above Chief Ministers of State outside their respective States.
 5. In Article 26, Secretary to Governor and Secretary to Legislative Assembly have been placed in position indicated based on his rank equivalent to a Secretary to Government. If Officers of other ranks occupy the position, their rank in the warrant will also automatically change.

By order of the Governor,

R. Ramachandran Nair
Chief Secretary to Government.

Appendix 2800C

RULES FOR THE ALLOTMENT AND OCCUPATION OF GOVERNMENT SERVANTS QUARTERS IN KERALA. (As per Para 2808)

1. *Short title.*- These rules shall be called the rules for the allotment and occupation of Government Servant's quarters in Kerala 1975.
2. *Extent of application.*- These Rules shall apply to all residential buildings under the control of the P.W.D or the District Collector, as the case may be, and do not apply to buildings under the control of other departments.
3. *Definitions.*- In these rules, unless there is anything repugnant to the subject or context.
 - i. "quarters" means buildings constructed, leased or acquired by the Government of Kerala for being let out to state Government Employees for their residence on payment of rent, which are under the control of the P.W.D or the District Collector, as the case may be;
 - ii. "Applicant" means a Government Servant who is eligible for allotment of a quarters and who submits an application for allotment of quarters in the form prescribed by Government;
 - iii. "Allottee" means a Government Servant to whom quarters have been allotted by competent authority but not occupied;
 - iv. "Occupant" means an allottee who takes possession of the quarters duly allotted to him after completing all formalities required as per these rules;
 - v. "Collector" means the District Collector appointed by Government to be in charge of the District;
 - vi. "Executive Engineer" means the Executive Engineer in charge of the P.W.D Buildings Division, having jurisdiction over the area where the quarters are situated or his subordinate officials who have been empowered to discharge his duties;
 - vii. "Assistant Engineer" means the Assistant Engineer of the Buildings section under whose jurisdiction the quarters are situated and who is directly in charge of the quarters;
 - viii. "Rent" means the monthly rent payable by the occupant for the quarters as specified in these rules;
 - ix. "Standard rent" means the rent fixed for a quarters by the P.W.D and got approved by Government based on its capital cost and other aspects as laid down in the relevant rules issued in that behalf;
 - x. "Pay" means pay as defined in Rule 12(23) part I of K.S.R.;
 - xi. "Family" for the purpose of these rules includes officer's wife/husband, children and step children residing with him/her.
4. (a) *Eligibility.*
 - i. The Government quarters are intended for allotment to the officers of the state government who do not have their own accommodation facilities in the place of duty.
 - ii. Quarters shall be allotted only to those officers who do not have residential buildings where their Headquarters lies or within towns or within a radius of 15 (fifteen) Kilometers from their offices, either in their own names or in the names of their husbands or wives as the case may be, or in the names of their unmarried sons or daughters whether inherited or purchased or obtained otherwise, including that under any hire purchase scheme.
 - iii. Non-availability of own accommodation facilities shall be clearly and specifically stated in the relevant column in the application for allotment of quarters. In case it is subsequently detected that the statement in the application form in this regard is not true to facts the allottee/occupant shall be liable to pay from the date of occupation of the quarters, penal rent at three times the rate of standard rent, fixed for the quarters and to eviction under the provisions the Kerala Public Buildings (Eviction of Unauthorised Occupants) Act, 1968 and the rules made thereunder, from the quarters forthwith and in addition, the allottee shall also be liable for disciplinary action under the relevant rules.
 - iv. In case any allottee or occupant of Government quarters subsequently acquire or obtains residential buildings in any manner referred to in rule 4 (a) the fact shall be forthwith intimated by the allottee/occupant to the Collector/the Executive Engineer, Buildings concerned and the allottee/occupant shall without fail vacate the quarters within one month from the date on which the allottee/occupant acquire or obtains such residential buildings. Occupation beyond the date of expiry of the said one month will be treated as unauthorised occupation and the allottee or occupant shall be liable to the penalties envisaged in these rules.
 - v. Failure to give timely intimation mentioned in clause (i) shall make the allottee liable to pay penal rent from the date of acquiring or obtaining such residential buildings till the date of vacating the Government quarters/buildings, at three times the rate of standard rent fixed for the quarters/buildings, in addition to the other penalties including disciplinary action.

(b) *Persons who are not eligible for quarters.-*

- i. Unmarried officers,
- ii. Officers who are not being paid from the consolidated funds of the State Government, like persons employed under local bodies, Government owned companies, corporate bodies and other quasi Government bodies.
- iii. Officers who have been evicted from the quarters due to violation of rules or other grounds.
- iv. Officers will be deemed to own house if there is a house in the name of wife/husband as mentioned in Rule 4(a) (ii).
- v. Persons borne on daily wages/work charged/contingent establishment.
- vi. Persons whose wife or husband has already been allotted quarters elsewhere.

Explanation: The following will be eligible to occupy the quarters.

- (1) Wives/Husbands of army and police Personnel, and
- (2) married persons whose wife/husband is no more or is legally separated, but having dependent child or children

5. *Type of quarters eligible for:* For the purpose of allotment, the quarters are classified into various types ----- architect input ??

6. *Allotment of quarters*

- i. The application for allotment of quarters other than those exclusively earmarked for PWD shall be made in the form in Appendix II to the Collector through the head of office who shall verify the correctness of the information furnished in the application and countersign it and forward it to the Collector as early as possible. If the applicant himself is the head of office he may forward the application to his immediate superior officer who shall forward it to the Collector.
- ii. The application for allotment of quarters exclusively earmarked for PWD shall be made in the form in Appendix II to the Executive Engineer Buildings for allotment
- iii. The Collector shall scrutinise the applications received by him, Defective applications, if any, shall be rejected and the applicants informed accordingly forthwith. If any application is found defective the applicant shall be given an opportunity to rectify it within seven days and if he complies with the directions it should be considered as valid application. All the valid applications shall be registered in a register of the applications. If more than one applications are received for a specific type of quarters on the same day priority shall be given to the applicant who have been working at the place for longer period and even that being equal in more than one case, the applicant who is older.
- iv. Separate registers or separate folios in a file book in the form in Appendix III shall be maintained for each type of quarters. A separate register shall be maintained for registering the applications which have priority in allotment and such applications shall be registered in both the registers simultaneously.
- v. An applicant or occupant who, due to promotion or otherwise becomes eligible for a higher type of quarters, may submit a fresh application for that type of quarters and shall be eligible for allotment of that quarters in the normal course according to the seniority in that group. In the case of an applicant, he will have claim to get the original type of quarters applied for when his turn comes in the normal course. In the case of an occupant he will be allowed to continue to occupy the quarters till the time he is allotted a higher type of quarter.
- vi. Quarters shall be allotted as soon as it falls vacant. In no case shall the allotment of a house be delayed for more than a week of its falling vacant.
- vii. The quarters shall be allotted strictly in accordance with the priority of applications in the respective group i.e., according to the priority of applications from the respective grades of officers for the type of quarters they are eligible for. In case a deviation from this rule for the allotment of quarters is found absolutely indispensable to meet any extraordinary and exceptional circumstances which' might justifiably warrant such a deviation, the District Collector shall address Government pointing out the special circumstances of the case and obtain prior orders in the matter.
- viii. The allotment order shall be issued to the applicant through the head of office concerned. The head of office shall forward the orders of allotment to the applicant as expeditiously as possible. The Collector and the head of office shall see that there is no delay in despatching the allotment order to the concerned officers. The liability on the part of the allottee for payment of rent for the quarters commences after seven days from the date of allotment orders or the date of occupation whichever is earlier. If by any chance the allottee does not require the quarters allotted to him he shall intimate the fact to the allotting authority within three days of the date of allotment order. If such intimation is delayed the allottee shall be liable to pay the rent of the quarters upto the date on which such intimation is received by the Collector subject to a minimum of one month's rent.

Note.- The applicants should intimate the District Collector in writing if their applications are to be cancelled, due to their transfer to another station, or promotion to a cadre making them not eligible for the quarters or any other circumstances making them not in need of the quarters. All such intimations shall be routed through their heads of offices with copy direct to the Collector.

- ix. An officer to whom the quarters is allotted should occupy the same within ten days of the date of issue of allotment order failing which the allotment shall be cancelled and the building allotted to the next applicant without intimation to the original allottee. The original allottee however, be liable to pay rent for a minimum period of one month.
- x. Applicants who are on leave at the time of issue of allotment orders shall be permitted to prolong the actual occupation of the quarters till they request in writing to the Collector. The advance rent payable shall be remitted within the time fixed and their liability to pay the rent of the quarters will commence after one week of the issue of allotment order.
- xi. In case where officers of the grade prescribed for a particular type of quarters, as laid down in rule 5 are not available or where they do not require accommodation in quarters provided by Government, the fact being, intimated to the allotting authority in writing, then such quarters may be allotted to other officers of a higher or lower grade if any who apply for such allotment until an officer of the particular grade eligible for the particular type of quarters becomes available and applies for allotment of the quarters. In the event of receiving such application, the allotting authority shall give notice to the then occupant of the quarters to vacate the quarters within one month of the receipt of such notice and the occupant shall vacate the quarters within this time limit without raising any objections, and the quarters shall than be allotted to such applicant or applicants on the basis of priority of application. If such applicant happens to be one who on any previous occasion did not want accommodation in the quarters and intimated the fact in writing to the allotting authority his application shall not be entertained and no re-allotment of quarters as contemplated here shall be made in his favour. If a lower type quarters is allotted to a higher Grade officer, the rent, to be realised shall be as per pay revision order in or the standard rent whichever is lower and if a higher type quarters is allotted, to a lower grade officers, the rent to be realised shall be as per pay revision order in force or standard rent, whichever is higher.
7. If an occupant due to revision, or other reasons, become ineligible for the type of quarters allotted to him but only to any of the lower type he may submit a fresh application for the type of quarters for which he is eligible. He shall be permitted to continue to occupy the quarter, provided he is willing to pay the standard rent or 7.5% of the pay in the revised scale calculated at the rate of pay he was drawing immediately before the reversion, whichever is higher, If he is not willing to this he shall vacate the quarters and wait for his turn for allotment of the quarters to when he is eligible for in the normal course.
8. The Executive Engineer/Assistant Engineer in charge of the building shall maintain a register of the allottees/ Occupant with details of the date of occupation, the date on which the building is vacated, rent collected, list of equipments fittings etc. The Assistant Engineer shall inform the allotting authority, viz. the Collector concerned within three days when a building falls vacant. He shall intimate the audit officer the occupancy of quarters from time to time.
9. Priorities for allotment of quarters will be available to the following:-
 - i. Government Servants, who are wives of Jawans serving in border area and who were killed in action or reported missing (To be certified by proper military authority)
 - ii. Officers who are physically handicapped. (To be certified by a medical Officer not below the rank of an Assistant Surgeon/Assistant Professor belonging to the particular speciality).
 - iii. Ten percent of the quarters inclusive of the special Priorities mentioned in rule 9 shall be reserved for allotment to members belonging to the Scheduled castes and Scheduled Tribes and a ratio of 1:1 shall be maintained between applicants belonging to Scheduled Caste and Scheduled Tribes.
 - iv. Government Servants who have entered into inter-caste marriage. (This should be certified by a Revenue Officer not below the rank of a Tahsildar)

Note.- Priority for clauses (1), (2), (3) and (4) shall be 1:1 with other non-priority applicants.

10. The following quarters in the Cantonment House Compound Trivandrum shall be reserved exclusively for personal staff of the ministers and Speaker.

Type I - 4Nos. (8 Families)
Type II - 5Nos. (6 Families)
Type IV - 2Nos. (2 Families)

Note:-

- i. Allotment of these reserved quarters shall be on the basis of priority of application from the personal staff of the ministers and Speaker. Among the applicants preference will be given to members of personal staff coming from areas outside Trivandrum city limits.
- ii. Applications from the members of the personal staff shall be forwarded to the District Collector, Trivandrum through the concerned Private Secretaries. Concerned shall intimate the allotting authority the fact when any person ceases to be member of the personal staff.
- iii. Anyone in the personal staff of the Ministers and Speaker who is willing to occupy lower type of quarters than the type eligible for as per the general rules if not available among the reserved quarters may be allotted such lower type quarters from among the above reserved quarters in the Cantonment House Compound.
- iv. If nobody from the personal staff of the Ministers and Speaker applied for or is available for allotment of the above mentioned reserved quarters, then such quarters shall be allotted to applicants from other Government employees according to the normal rules subject to the definite condition that the allottee should vacate the quarters without fail when members of the personal staff of Ministers of Speaker apply for the quarters with one months notice.
- v. Members of the personal staff Ministers or Speaker who do not require allotment of these reserved quarters shall be eligible for allotment of quarters only in accordance with the normal rules followed in this regard.
- vi. Members of the personal staff of Ministers and Speaker, who are not Government employees shall vacate the quarters, thus allotted to them within a month positively from the date on which they cease to be members of the personal staff of the Ministers and Speaker.
- vii. Members of the personal staff of Ministers and Speaker who are Government servants and who get allotment of these reserved quarters by virtue of the fact that they happen to be members of the personal staff of Minister and Speaker, may continue to occupy such quarters even after they cease to be members of the personal staff of Minister and Speaker, subject to the condition that in case request for allotment of such quarters are received from members of the personal staff of the Ministers and Speaker the said occupant shall vacate the quarters with one month's notice without fail. Such Government servants shall however be eligible for allotment of quarters in accordance with the general rules. The allotment of these reserved quarters to such Government Servants by virtue of their position as members of the personal staff of Minister and Speaker shall not affect their priority in the general list of applicants, in case such Government Servants had already applied for allotments of quarters even before the special allotment of the quarters reserved for personal staff of Ministers and Speaker. To get priority in the general list separate application as per the general rules will have to be made to the allotting authority.
- viii. Other conditions in the general rules prescribed herein shall also apply in the allotment of these reserved quarters.
 - ix.
 - i. The following quarters at Kaudiar, Trivandrum shall be reserved exclusively for allotment to the following categories of officers subject to the general rules prescribed herein.
 - 1) Quarters No: 2- Police officers in the rank of Superintendent of Police.
 - 2) Quarters No: 3- Chief Engineers P.W.D
 - 3) Quarters No: 5- District Sessions Judge, Trivandrum.

Note: - The quarters at Kawdiar are intended for allotment to class I officers of the state Government who do not have residential accommodation of their own in Trivandrum. For the purpose of this rule class I Officers will be Officers whose actual basic pay is Rs. 14,900 per mensem and above and officers be longing to all India Services.
 - ii. The Chief Engineers' quarters at Observatory Compound shall be exclusively allotted to PWD Chief Engineers **by the CE (Buildings)**.
11.
 - i. An agreement in appendix X (7) shall be executed by the allottees of the quarters before the quarters are actually occupied by them.
 - ii. The lease agreement to be executed shall be on plain paper, the stamp duty being payable by the Government. The Executive Engineer, Buildings in charge of the quarters shall be competent to accept the agreement on behalf of the Governor of Kerala and these agreements shall be recorded in his office duly numbered and entered in a separate register of Agreement.
12.
 - i. Electricity charges and water charges where such amenities are available shall be payable by the occupants direct to the Kerala State Electricity Board, Kerala Water Authority or other bodies maintaining such system.

ii An amount equal to two months standard rent of the building shall be deposited by each Government Servant as advance before occupation of the house and this amount shall be refunded to him when he/she vacates the building after deducting the dues to Government, if any, and on production of a non-liability certificate from the Collector concerned. Of the two months standard rent, one month (standard rent will be collected as initial advance and the balance of one month's standard rent will be collected as additional advance in two equal monthly installments.

Note.- The meter reading on the date of occupation will be noted, and the occupant shall be responsible for payment towards further consumption charges. If in the first bill received, any charges pertain to the period of occupancy of the previous occupant the Asst. Engineer concerned shall collect the proportionate amount due from the occupant and settle the bill, meeting the difference from Government funds. The amount so advanced shall be debited to the suspense head 'Misc. P.W. Advance' and promptly recovered from the previous occupant.

13. i The occupants shall provide their own furniture, or other required materials and electric bulbs.
*Note:-*Where any items of furniture is provided by Government, rent for the same as fixed by Government, shall be payable by the occupant in addition to the rent of the quarters. In such cases no option shall be available for the occupant for non-payment, of additional rent on the plea that such furniture is not used/required by the occupant.
- ii An inventory of articles available in the quarters shall be prepared in duplicate by the overseer concerned and signed by the occupant and the Asst. Engineer as soon as the allottee occupies the house. The original at the inventory shall be kept by the Asst. Engineer and the duplicate by the occupant. The occupant shall be responsible for all articles included in the inventory until they are handed over to the Asst. Engineer at the time of vacating the quarters and an acknowledgement obtained for the same.
Note:- If any articles are lost or damaged while in the custody of the occupant, the cost thereof shall be recovered from the occupant as if it is arrears of rent. The cost of articles shall be fixed by the Asst. Engineer, at book value / market value plus 210 per centage whichever is higher.
After the requirements of the rules are duly fulfilled the key of the quarters shall be handed over to the allottee by the Asst. Engineer concerned.
14. The occupant shall keep the quarters and premises neat and tidy and shall be liable to make good any damages to the building and its installations caused during his/her occupancy other than by normal wear and tear. Damage caused due to carelessness or in advertence of the occupant shall be repaired departmentally and cost recovered from the occupant, as if it is arrears of rent.
15. i Rent payable by the occupant of the quarters shall be as per pay revision order in force or the standard rent whichever is lower or the amount fixed in accordance with the rules in force from time to time.
Explanation:- For the purpose of this rule, the definition of pay occurring in rule 12(23), K.S.R., Part I shall be the basis for reckoning the pay for calculation of the rate of rent.
- ii If the husband and wife are Government Servants and residing in the quarters, rent payable shall be calculated on the basis of the pay of the person drawing higher rate. However, the rent shall be payable by the person in whose name the quarters are allotted. The allottee in such cases shall intimate the Executive Engineer, Buildings concerned the change in the rates of pay of himself/herself as well as his wife/her husband. Both the occupants shall be held jointly and severally responsible for payment of rent and other requirements of these rules as far as applicable to them.
- iii House rent allowance shall be denied only to the allottee of the quarters whether it is the husband or the wife as the case may be.
- iv The standard rent shall be fixed at 8% (eight per cent) of the capital costs of the building.
- v Payment of rent or arrears therefore shall be made by short-drawal in the salary bills of officers to whom quarters are allotted.
- vi In the case of occupants who proceed on leave or are placed under suspension the rent payable may be 7.5% of a complete month's pay drawn by him immediately before he proceeds on leave or is placed under suspension of standard rent, whichever is lower and the amount shall be realised from his leave salary or subsistence allowance, as the case may be. In case no leave salary or subsistence allowance is recoverable from the occupants, the rent payable shall be recovered from the occupant as detailed in rule 30.
16. i A Government Servant occupying the quarters when transferred from the station shall vacate the quarters within a period of one month from the date of order of the transfer. The Allotting authority

may consider request for grant of extension of time for occupation of the quarters on merits and grant extension for a period not exceeding six months in all or till the end of the academic year, whichever is earlier on usual rate of rent. No further extension shall for any reason be allowed. Action shall be taken for eviction of the occupants after the extended period.

Note:- This rule shall not apply if the quarters are occupied by husband and wife who are both Government servants and if only one of them is transferred from the station. If the quarters is allotted in the name of the person transferred it shall be transferred to the name of the other person and rent recovery shall be effected based on the pay of the occupant in such cases. The formalities regarding registration of application and allotment detailed in rule 6 shall not be applicable in such case of transfer of allotment.

- ii Government servants occupying the quarters who retire from service shall vacate the quarters on the date of retirement. If they however wish to continue occupation on account of unavoidable circumstances they shall apply to the allotting authority sufficiently early and in any case before fourteen days prior to the date of retirement. The allotting authority may consider the request for grant of extension for a period not exceeding six months in all or till the end of the academic year whichever is earlier. No further extension shall on any score be allowed. Action shall be taken for eviction of the occupants after the extended period. If the request of the Government servant for continued occupation is granted they shall pay the standard rent in advance before 5th of every month and also shall give an undertaking in writing to the allotting authority to the effect that they shall be liable to the dues to Government if any being recovered from their person, in case they fail to pay the dues. If the occupant continues occupation of the quarters unauthorisedly after the date of retirement action shall be taken to evict them.
- iii Where occupancy terminates due to retirement or other causes, the officer's last pay shall be disbursed only on receipt of the certificate of the Executive Engineer concerned that no rent is due from the officer. Receipt of this certificate shall also be a condition for the issue of nonliability certificate or on behalf of the officer before final settlement of his retirement benefits or payment of gratuity/pension to family.
- iv In case an officer goes on long leave for more than six months, previous sanction of Government shall be obtained for the continued occupation of the quarters. In such cases rent shall be calculated and realised at the rate prescribed in rule 15. For the purpose of this rule, the amount of pay drawn by the officer immediately before the commencements of the leave shall be the basis for determining the amount of rent to be realised from the officer.

Note:- Heads of office shall ascertain from the persons working under them and occupying quarters, whether they have left any arrears of rent or other dues or show such amount in L.P.C. issued to Accountant General after retirement of the officer for settling their terminal dues, if the individual concerned does not pay the dues before that.

- 17. i Whenever possible, the occupant shall give advance information to the Assistant Engineer concerned about vacating of quarters. Normally this period shall be 30 days in advance of the proposed date of vacating. In any case, a minimum period of 7 days shall be insisted. If any occupant surrenders the key, without any advance notice, he shall be liable to pay rent, for another 7 days also. The notice of vacating the quarters shall be sent simultaneously to the District Collector and the Executive Engineer concerned, specifying the date on which quarters are proposed to be vacated.
- ii The Assistant Engineer concerned shall arrange to verify the condition of the quarters and other amenities provided therein jointly with the occupant, if possible, with reference to the list prepared at the time of occupation. Proper charge papers shall be prepared in duplicate signed by the occupant and the Assistant Engineer and one copy kept by each. If any damages or losses are noticed the fact should be noted in the charge papers. These shall be assessed by the Assistant Engineer within one week and details intimated to the Executive Engineer for taking action for recovery from the occupant.
- iii The occupant shall produce the latest bill and relative receipt in support of payment of electric current charges and water charges to the Assistant Engineer, at the time of vacating the quarters. The metre readings as on the date of vacating shall then be taken by the Assistant Engineer and amount yet to be paid by the occupant worked out. The occupant shall pay such amount to the Assistant Engineer, at the time of surrendering the key and obtain proper receipt. This shall be credited to "Deposits" in the accounts of the Executive Engineer and payment of Electric current or Water charges, when the bills are actually received, arranged by the Assistant Engineer, by drawing

- from the deposit amount. Balance, if any, will be refunded to the occupant after settling all liabilities. If the amount recovered is found inadequate, the differences shall be met from the advance rent available in deposit and if that too is insufficient the required amount shall be met initially by the P.W.D. and subsequently recovered from the occupant, as detailed in rule 30.
18. The demand statement for recovery of rent should normally reach the head of office by the 25th of each month. If due to any reason, the demand statement is not received in time, the head of office shall effect the recovery based on the previous month's demand statement and intimate the fact to the Collector, if the occupant continues to occupy the quarters during the month also.
 - i It shall be incumbent upon the head of office to recover the amount as shown in the demand statement. If there is any real error or mistake in the demand made, it may be pointed out after effecting the recovery and got adjusted in the subsequent demands.
 - ii The advance rent paid by the occupant shall not normally be adjusted towards rent due. It shall be refunded only on the basis of the certificate from the Assistant Engineer concerned that no liabilities are due from the occupant, after quarters are vacated and key and other articles handed over.
 19. If any occupant, contravene any of the provisions of these rules or conditions in the agreement executed by him, it shall be lawful for the Collector concerned to cancel the allotment of quarters made to him. A memo to this effect will be sent to the occupant, setting forth the irregularities noticed, through his head of office and the occupant shall vacate the quarters within 30 days of the date of such memo.
 20. If the occupant fails to vacate quarters within the time allowed by rule 19, the Collector shall inform the occupant about the irregularities committed by him and get his statement as a reply. The occupant shall be bound to submit his reply within 7 days of the receipt of the show cause notice. If the reply is not found to be satisfactory, the Collector shall serve the notice of eviction on the party through the head of his office, simultaneously informing the head of office that the party has been served the notice of eviction earlier.
 - i. The head of office shall serve the orders of eviction to the occupant as immediately as practicable and direct him to vacate the quarters within a week and produce clearance certificate to that effect from the concerned Assistant Engineer. If the occupant fails to vacate the quarters and produce the certificate within a week the head of office shall issue orders placing the occupant under suspension with immediate effect. If the head of office himself is not competent to place the officer under suspension he shall immediately take action to get the orders of the officer competent to do so, and in any case the suspension orders shall take effect from the date after a week in which the eviction orders are served to the occupant.
 - ii. The employees under suspension shall be reinstated in service only on receipt of a clearance certificate from the Assistant Engineer in charge of the quarters. He shall be deemed to have been reinstated in service the day following the day of production of certificate.
- Note :-*
- a The period of suspension may be regularised by the authority competent, as eligible leave, excepting casual leave.
 - b If the occupant fails to vacate quarters within a reasonable time even after placing him under suspension, action shall be taken to evict the occupant under the provisions of the Kerala Public Buildings (Eviction of Unauthorised occupants) Act, 1968 and the rules made thereunder.
 - c For the period of stay in the quarters beyond the date permitted by rule 19, rent at 3 times, the normal rate shall be recovered from the occupant.
21. An appeal shall lie against the orders of eviction to the Government in the Public Works Department. But filing of such an appeal shall not in any way empower the occupant to continue to occupy the quarters, if however, the State Government after examining the facts of the case, set aside the orders of eviction appellant shall be eligible for registration and shall be allotted a quarters falling vacant next i.e., in preference to all other registered applicant.
 22. If any, occupant commits violation of any of these rules and the cancellation of allotment and eviction from quarters, is not considered necessary, the Collector shall intimate the head of office about the violation of rules with a request to initiate departmental disciplinary proceedings against the occupant. The head of office there upon shall initiate disciplinary proceedings, as per the Kerala Civil Servants (Classification, Control and appeal), Rules and award appropriate punishment if the occupant is found guilty.

- Note :-* (i) Warning is not treated as punishment. If the charges are proved, one of the punishment specified in the K.C.S. (CC&A) Rules shall be awarded.
- (ii) The Head of office shall intimate the Collector about the outcome of the disciplinary proceedings and the final findings of the case in due course.
23. (1) The quarters shall not on any account be sublet, or shall not be shared with anybody without the written permission of the Collector concerned. Even in cases where such permission is granted, the liability for payment of rent shall rest on the person to whom the quarters is allotted.
- (2) In the event of the death of either the husband or wife (allottee of the quarters) occupying the same quarters with the family i.e. husband and wife with children, the quarters shall be allotted to the surviving person (husband or wife) in case he/she is also a Government employee.
- (3) In the event of the transfer of either the husband or wife (allottee of the quarters) occupying the quarters with family i.e., husband and wife with children, the quarters may be reallocated to the other persons (husband, or wife) occupying the same quarters in case he/she is also a Government employee and continue to work in the same station even after the transfer of the allottee.
24. (1) The occupants shall not make any addition, alterations or repairs to the quarters or any of the installations therein, even at their own cost. Repairs or replacements required shall immediately be brought to the notice of Assistant Engineer concerned for further action. Electrical wiring, pipes laid, etc., shall not be interfered or tampered with.
- (2) Additional amenities like installation of telephones, ceiling fans etc., at the cost of the occupant, can be provided only under written permission of the Assistant Engineer.
- Note.-* The occupants may put up at their cost temporary fence within the area compound if any set apart for the quarters for protecting garden or other vegetable plantations from stray animals for which no special sanction is required. But this may be done in consultation with the Assistant Engineer concerned.
- (3) The occupant while living in quarters shall conduct himself decently, without, in any way causing inconvenience to the neighbours. Unnecessary quarrels, state of drunkenness or other undesirable behaviour shall be treated as misconduct, and such occupants shall be liable to be evicted on such grounds alone, without notice.
25. (1) Without prejudice to any of the provisions contained in these rules or any other rules prescribed in this behalf, the government shall have the right (a) to refuse to register any particular applicant or (b) to terminate any of the allotment already made; without assigning any reasons and in the latter case, the occupant shall forthwith vacate the quarters and surrender possession as laid down in these Rules. No appeal shall be entertained on such orders. These rules are issued in suppression of all previous rules issued in this behalf and the occupant, who have been allotted quarters already, in pursuance of the rules then in force, shall be deemed to be governed by these Rules hereafter.
- (2) These rules shall be supplementary to the relevant rules in Kerala Financial Code, the Kerala Public Works Account Code and the Kerala Public Works Department Code and subject to the general rules regarding fixation of rent of Government quarters framed by Government in this behalf from time to time.
26. The occupant shall keep the Collector and the Executive Engineer concerned informed of changes in their pay, station, address and such others events like transfers, promotion etc., during the period of their stay in the quarters.
- Note.-* When the occupant proceeds on leave, tour, for more than two weeks and leaves his headquarters with family the fact shall be intimated to the Assistant Engineer in charge, in writing.
27. The occupant may reside in the quarters without his/her family or keep it locked up for a maximum period of 3 months for reasons like hospitalisations and other treatments, conception, vacation etc. This period may be extended up to six months in exceptional case, with the permission of the Collector in writing. But if such periods exceed six months the quarters shall be vacated and the key and other articles properly handed over as provided in these Rules. Failure to do so shall entail eviction as well as departmental disciplinary proceedings.
28. Liabilities, if any, left by an occupant while vacating the quarters, shall be assessed and finalised within 7 days of the date of, vacating. If the amount of liability is more than the advance rent available with the Executive Engineer a special demand shall be issued to the head of office immediately. The amount as per the special demand shall be recovered in from the pay of the occupant and remitted to the Executive Engineer, by the head office. If the occupant has left on transfer, the amount due shall be intimated to the new head of office in writing. But if such instances exceed six months the quarters

shall be vacated and the key and other article properly handed over as provided in these rules. Failure to do so shall entail eviction as well as departmental disciplinary proceedings.

Note:- Postal Commission for remitting the amount recovered by M.O. to the Executive Engineer concerned shall be met from the office contingencies of the head of office concerned.

29. The applicant, allottees and occupants as well as past occupants of the quarters, shall be liable to be governed by these Rules as well as any other rules and conditions prescribed by Government in this behalf from time to time.
30. Notwithstanding anything contained in the above said provisions any amount due to Government from any occupant or past occupant, shall also be recovered from his/her properties movable or immovable under the Revenue Recovery Act for the time being in force, as though they are arrears of land revenue, or in any other manner as the Government may deem fit.
31. Notwithstanding anything contained in these Rules, the Government shall be competent to terminate the allotment without assigning any reason whatsoever and the occupant shall thereupon vacate the building within one month of the receipt of notice of termination.
32. Notwithstanding anything contained in these rules, Government may, in deserving cases, dispense with or relax the provisions of any rules to such extent or subject to such conditions as they may deem fit.

Appendix 2800D

AGREEMENT TO EXECUTED BY ALLOTTEES (As per Para 2808)

THIS LEASE DEED executed on this
.....(herein after called "the lessee") on the one part and the Governor of Kerala (herein after called "the lesser") of the other part.

WITNESS As follows:

In consideration of the rent herein reserved and the covenants on the part of the lessee hereinafter contained in, Lesser both hereby demise unto the lessee.....
.....more particulars mentioned and described in the schedule hereto.

1. The Lessee hereby covenants with the Lesser as follows:

i) The Lessee shall during the continuance of the lease pay a month rent which will be standard rent or 7 ½ % of the pay (including DP) whichever is lesser.

Provided when both the husband and wife occupying quarters are Gazetted officers) rent will be calculated on the basis of the pay of the persons drawing the higher rate of pay. Payment of rent or arrears thereof shall be made short drawals in the salary bills of the lessee.

ii) The Lessee shall not sublet the building or accommodate he is expect to maintain.

iii) The Lessee when vacating the building shall hand over charge of the Building.

iv) The Lessee whom intends to vacate the building shall, except in case of sudden transfer intimate the fact to the Executive Engineer in charge of the Building at least one months before the date on which he intends to vacate the building failing which he shall be liable to pay rent for the period of one months from the date of vacating or till the date of occupation of the building by another person whichever is earlier.

v) The Lessee when transferred or retired shall vacate the building within one month of the date of retirement or transfer unless extended by the Government for a further period. In case the Lessee is unable to vacate the building as aforesaid due to unavoidable circumstances he shall apply to Government sufficiently early. The Lesser shall pay rent in the case of retirement in advance before the fifth of every month.

vi) The Lessee shall pay all dues by way of water charges, current charges and cleaning charges except property tax due to the local body concerned.

vii) The Lessee shall keep the building in neat condition and shall be liable for any damage caused to the building and the installations therein.

viii) In case the Lessee commits breach of all or any of the terms and conditions herein contained, the lessee shall cease to have any right of occupation of the quarters and the Lesser shall thereupon take possession of the quarter.

ix) Notwithstanding anything herein contained, the Lesser shall be competent to terminate the lessee without assigning any reason whatsoever and the Lessee shall, thereupon vacate the building within one month, of the receipt of the notice of such termination.

x) The Lessee shall provide his own furniture, materials and electric bulbs.

(1) The Lesser herein covenants with the Lessee as follows:

(i) The Lessee regularly paying the rent hereby reserved and agreed to be paid and on performing and observing all the covenants and conditions stipulated hereinafter contained to be observed on the Lessees part shall peacefully and quietly held and enjoy and leasehold quarters and premises attached thereto during the currency of the lease without any interruption by the Lesser except as otherwise provided for heroin. The Lesser shall carry out the annual maintenance such as white washing, minor repairs etc., of the lease hold at Lesser's cost.

(ii) The Lessee further agree that all amounts due from him on account of damage caused to the building and installations during his stay or any other dues for which he becomes liable to the lesser under this deed shall be recovered by the Lesser by deduction from the Lessee's pay bill.

(iii) Without prejudice to the rights of the Government under the proceeding clauses all sums found due to Government under or by virtue of this agreement shall be recovered from the Lessee and his properties movable and immovable under the provisions of the Revenue Recovery Act for the time being in force as though they are arrears of land revenue or any other manner as the Government may deem fit.

(iv) Consistent with these rules the Lessee shall be liable to abide by the rules and conditions regarding the allotment and occupation of the quarter now in force and also such terms in that regard.

(v) The Lesser shall bear the stamp duty with which this document is chargeable.

IN WITNESS WHEREOF the Lessee and for and on behalf of the Governor of Kerala have hereunto set their hands the day and year first above written.

Signed by the Lessee

In the presence of Witnesses:

Appendix 2800E

Handing over/Talking over Statement of Residential Buildings (As per Para 2808)

Reference.

Quarter No

Building has been taken over from on the Forenoon/Afternoon of .
..... with the following fixtures and fittings.

Details of fixtures and fittings.

Water meter reading at the time of handing over/taking over is -----

Ele. meter reading at the time of handing over/taking over is -----

Handed over Taken over by

Signature.....

Appendix 2800F

Proforma for fixation /revision of Rent.

(As per Para 2809.5)

1. Name of Office (s) by which the building is taken on rent
2. (a) Present house No. assigned by Corporation/ Municipality/ Panchayat and address
(b) Old House No. assigned immediately after construction by the Corporation/ Municipality/Panchayat (This information is for verifying the age certificate issued by local bodies)
3. Revenue survey No. (a) name of village in which the building is situated.
4. Actual extent of land made available for the exclusive use of the office (a) maintained in item (1) above.
5. Name and address of the owner of the building and land
6. No. and date of certificate issued by the Corporation/Municipality/Panchayat in support of the age of the building
7. No. and date of certificate issued by the Tahsildar in support of the land value

8. Whether the certificates as per items 6 & 7 above have been verified by the owner and head of the office occupying the building
9. Whether these two certificates have been attached to this proforma in original
10. Whether this is for initial fixation of rent or for revision of rent.
11. If this is or revision of rent furnish details of earlier fixation here
12. Monthly rent demanded by the owner for the present fixation
13. Whether the owner has given written consent to accept the rent fixed by the PWD
14. Date from which the rent is to be fixed for revision
15. Date on which written application of owner for revision of rent (in case of revision) received by the officer above.
16. Signature of the owner(s) of the building and land mentioned above in token of having verified and satisfied with the attachments above.
17. Staff strength (Category-wise) of the office(s) accommodated in the above building (for calculating admissible area as per norms)
18. Additional space requirements if any sanctioned by competent authorities for the essential use of the above office (s)
19. Whether Govt. order regarding norms to be observed while taking private building on rent for Govt. purpose have been followed and certify that no other suitable building at lower rent is available.
20. Signature with date and designation of the Head of the Office (s) occupying the building in token of having verified and satisfied of the correctness of the information furnished in items 10 to 18 above
21. Date of forwarding to PWD
22. Date of receipt at PWD office
23. Whether the receiving office of the PWD verified and satisfied that information required as per all columns above have been furnished in full and the certificates attached in original.
24. Whether a dimensioned sketch /plan showing each floor, outhouses, extensions etc. has been prepared by the PWD office and attached to this proforma.
25. Whether specifications of each portion of the building(s) have been prepared and furnished along with this proforma.
26. Whether a dimensioned sketch/ plan showing the compound wall gate well, other structure etc, if any, has been prepared/ verified and furnished along with proforma.
27. Whether rent calculation as laid down in the related circulars in force have been worked out with all details and furnished along with details.
28. Monthly rent arrive as per rent calculation.
29. Whether a certificate showing the non-available of Govt. building for accommodating the above office has been furnished along with this.
30. Whether certificates regarding the structural stability has been furnished along with this.
31. Signature with date and designation of PWD officer in token of having verified and satisfied on item 21 to 30 above.

Appendix 2800G

Lease deed for Buildings to be hired for Government Purpose (As per Para 2809.5)

This lease deed is executed on this the day oftwo thousand and betweenaged son ofresiding atTaluk (here in after referred to as "the lesser") of the one part and the Governor of Kerala represented by the or an officer duly authorised by him (here in after referred to as "the lessee") of the other part.

WITNESSETH AS FOLLOWS

In consideration of the rent herein reserved and of the covenants on the part of the lessee herein after contained, the lesser do hereby demise upto the lessee the building bearing No..... and situated in the property mentioned and described in the schedule hereto together with the water supply sanitary and Electrical installations for a period from to for the purpose of accommodating Government or other public offices subject to the terms and conditions herein contained.

1. The lessee shall pay to the lessor during the period of the lease hereby created a monthly rent of..... (Rupees) such rent to be paid by the lessee to the lessor regularly.
2. The lessee shall also pay in addition to the rent mentioned above the charges for electricity and water consumed during the lease period and the meter hire charges for water and electric meters payable from time to time during the period of lease, provided that the hire charges for the water meter and electric meter actually paid by the lessee shall be deducted from and adjusted against the Vent payable by the lessee and only the balance amount after deduction shall be paid by the lessee every month.
3. It is hereby agreed that the lessee paying the rent hereby reserved and performing and observing each of the covenants herein contained may peacefully hold and enjoy the said building during the lease period without any interruption by the lessor or any person lawfully claiming under him.
4. The lessor shall pay all existing and future taxes, rates and assessments in respect of the lease hold including the Municipal or other tax assessed by a local authority on the value of the building or annual letting value of the building and all other rates, taxes and assessment levied by any authority whatsoever.
5. The lessor shall at his own expense keep the demised building in good substantial repair and also attend to the annual maintenance of the building such as white washing, painting, etc so as to keep the exterior and interior of the demised building and the additions, if any, thereto and the boundary walls and fences, the sanitary and other installations in good and habitable condition.
6. In case the lessor makes default to carry out the repairs and maintenance even after one month of receipt of notice in writing given by the lessee to do the repairs and maintenance it shall be lawful for the lessee to execute such repairs and maintenance and deduct the expenses from the rent which shall then be and thereafter become due and payable under or by virtue of these presents.
7. If the lessee shall desire to determine the lease at any time during the period of the tenancy and shall give to the lessor not less than three months' previous notice in writing of such desire and shall upto the time of such termination pay the agreed rent and perform and observe the various covenants on his part to be performed and observed, then immediately on the expiry of such notice period the present demise and everything herein contained shall cease and be void but without prejudice to the rights, remedies and claims of either party against the other in respect of any antecedent claim or breach of covenant.
8. The lessor further agrees that he shall, if so required by the lessee, do and execute any alterations or additions to the leasehold subject to such further conditions including rate of rent as may then be mutually agreed upon.
9. This lease may be extended beyond the expiry of the lease period by mutual consent, in which case all the conditions in this lease deed except that relating to the rate of rent for extended period shall continue to be valid.
10. The lessee shall on the expiry of the said term or sooner determination thereof deliver possession of the demised premises to the lessor in as good a condition as it was when the lessee obtained possession subject only to the changes caused by reasonable wear and tear or irresistible forces. The lessee shall not be liable to pay any compensation to the lessor for damages caused to the building due to reasons beyond the control of the lessee.
11. In case the lessee holds over or does not deliver possession of the building on the termination of tenancy as provided above, the lessee shall continue to be liable for payment of the rent for the period the lessee remains in possession or deprives or prevent the lessor from taking vacant possession of the said premises, provided however that such period shall not exceed three months.

In witness where of the lessor and Sri..... (the lessee) for and on behalf of the Governor of Kerala have here unto set their hands the day and year first above written.

SCHEDULE ABOVE REFERRED TO

Serial No.

Registration District :
Registration Sub District :
Taluk :
Village :
Tenure :
Thandaper No. :
Corporation/Municipality/ Panchayath :
Survey No. :
Extent :

Description of the Building –

BOUNDARIES

North :
East :
West :
South :

DESCRIPTION

Schedule of Electrical, Water Supply and Sanitary fittings in building No.....

ELECTRICAL INSTALLATIONS

Sl.No.	Details	Nos.
1.	Light points	
2.	Fan points & fan (ceiling)	
3.	Plugs. etc.	

WATER SUPPLY AND SANITARY INSTALLATION

1. Wash basin :
2. Water taps :

Signed by the Lessor

In the presence of witnesses:

1) (address)
2) ”

Signed by the lessee Shri.....

(for and on behalf of the Governor of Kerala)

In the presence of witnesses:-

(1) (address)
(2) ”

This document is typewritten

Total

Corrections:

(Lessor) (Lessor)-

Appendix 2800H

Lease deed For letting out Government Building/ Property (As per Para 3011)

This lease deed is executed on this theday of Two thousand and between the Governor of Kerala (here in after called "the Lessor") of the one part and Shri/Smt aged son of/daughter of/wife of/Shri of house village Taluk District/ a society/Bank registered under the Act and having its registered office at (hereinafter called "the Lessee") of the other part.

WHEREAS at the request of the Lessee the Lessor has in order No dated agreed to let the building owned by the lessor bearing No and more particularly mentioned and described in the Schedule hereunder written for a period of years from

..... on a monthly rent of Rs (Rupees)
.....) subject to the terms and conditions hereinafter contained.

And whereas by way of security for the due fulfillment of the terms and conditions of the lease the lessee has deposited a sum of Rs. (Rupees) with the lessor.

Now these presents witness as follows:-

1. In consideration of the rent herein reserved and of the covenants on the part of the lessee hereinafter contained the lessor both hereby demise into the lessee by way of lease the building bearing No. more particularly mentioned and described in the schedule hereto together with the water supply, sanitary and electrical installations to hold the same for the purpose of for a period of commencing from on a monthly rent of the first of such payment to be made on

2. The lessee covenants with the lessor as follows:-

- (i) to pay the monthly rent of Rs. in advance on or before day of that month.
- (ii) in addition to the monthly rent to pay all charges for electricity and water consumed during the lease period and the meter hire charges for water meter and electric meter payable from time to time during the period of lease.
- (iii) to keep the exterior and interior of the demised premises, the drains, the soil and other pipes and sanitary and water supply installation and electric fittings and fixtures thereof in good condition.
- (iv) not to make or permit to be made under any circumstances any alterations in or additions to the demised building.
- (v) to use the demised premises only for the purposes for which it is leased out, namely for the (hereafter the purpose) and for no other purpose.
- (vi) not to assign, sublet, transfer or otherwise part with possession of the leasehold or any part thereof.
- (vii) at the expiry of the period of this lease or determination thereof as provided hereunder to peacefully and quietly surrender to the lessor the leasehold in the same condition as it was handed over to the lessee,
- (viii) that in case of breach by the lessee of all or any of the covenants on his part to be observed and performed, it will be competent for the lessor to terminate the lease without reference to the period of lease herein before reserved and to retake possession of the building without notice.
- (ix) that it shall be lawful for the lessor to revise and refix the lease rent herein reserved at the end of every three years and the lessee is bound to pay the revised rent so fixed.

3. The lessor covenants with the lessee as follows:-

- (i) to pay all existing and future taxes including property tax, ground rent and other charges, if any, payable by the owner thereof.
- (ii) that the lessee paying the rent hereby reserved, and observing and performing each of the covenants and stipulations herein contained, may peacefully hold and enjoy the demised premises during the lease period without any interruption by the lessor.
- (iii) to keep the premises in good repair during the period of the lease.
- (iv) to repay to the lessee on the expiry of the period of lease or sooner determination the security deposit of Rs or so much part thereof as is found due to the lessee after the settlement of accounts between the lessor and the lessee.

4. On the expiry of the term of for which the lease is granted, it shall be open to the lessor to renew the lease or terminate the same according to the convenience and pleasure of the lessor.

5. If either party desires to determine the present demise shall give to the other party not less than three month's notice in writing of such desires then immediately on the expiration of such period, the present demise and every thing herein contained shall cease and be void, but without prejudice to the rights remedies of either party against the other in respect of any antecedent claim or breach of covenant.

6. Notwithstanding anything herein contained the lessor reserves the right to terminate the lease at any time without assigning any reason and without notice.

7. All sums found due to the lessor under or by virtue of this Deed shall be recoverable from the lessee and his/her properties movable and immovable under the provisions of the Revenue Recovery Act for the time being in force as though such sums are arrears of land revenue and in such other manner as the lessor may deem fit.

In witness whereof Shri for and on behalf of the lessor and Shri the lessee have hereunto set their hands the day, month and year first above written.

(H.E. the description of the property)

Signed by Sri for and on behalf of the lessor.

In the presence of witnesses:-

- (1)
 (2)
 Signed by Shri the lessee.
 In the presence of witnesses:-
 (1)
 (2)

Appendix 2900A

8.1.1.1 Register of movable Assets (As per Para 2901)

Division/ Sub Division/ Section:

Group head:

Sl No	Description of the article	Identification No.	Date of receipt source and reference to voucher	Price of article	Number	Remarks
1	2	3	4	5	6	7

Note:- In column 4 quote the C.B.V. No. in case of purchases paid for in the division or transfer note if transferred from other divisions.

In column 5 note price if known. Where tools and plants are transferred for numerical accounting without value rate "transferred without value"

Where any item is finally disposed by transfer from the division, sale, destruction or through any other cause the fact should be noted in remarks column so that the concerned item is eliminated from the register.

Appendix 2900B

8.1.1.1.2 Register of movements of movable Assets (As per Para 2901)

Division:

Group head:

Sl No	Item No	Description	Date and reference to voucher No	Destination	Date	Movements								
						From		to						
						Sub-division	Section	Division	Sub-division	Section				
1	2	3	4	5	6	7								

Appendix 2900C

Transfer Note (As per Para 2901)

(Original)

Tools & Plant Transfer Note No Division
 To Dated.....

The following items of Tools & Plant are transferred to you. Please acknowledge.

Sl No	Identification No	Description of articles	Number / quantity issued	Remarks
1	2	3	4	5

.....Engineer

(Duplicate)

Tools & Plant Transfer Note No Division
 To Dated.....

The following items of Tools & Plant are transferred to you. Please acknowledge.

Sl No	Identification No	Description of articles	Number / quantity issued	Remarks
1	2	3	4	5

.....Engineer

(Triplicate)

Tools & Plant Transfer Note No

.....Division

To

Dated.....

The following items of Tools & Plant are transferred to you. Please acknowledge.

Sl No	Identification No	Description of articles	Number / quantity issued	Remarks
1	2	3	4	5

.....Engineer

8.2

Appendix 2900D

History Book (As per Para 2911)

Registered number :

Date of purchase :

Model/ make and manufacturer :

Cost of equipment :

Name of Owner/ Division:

Equipment number as per register of Movable Assets:

Sl no.	Maintenance schedules				Transfer from division / offices	*Details and validity of			Special remarks
	Date of repairs	Type of repair	Cost of repair	Replacements		Tax	Insurance	Pollution Certificate	

Appendix 2900E

8.2.1 Goods Received Sheet (As per Para 2913.2)

Division

Subdivision

Section

Name of supplier.....

Sl No	Date	Invoice/R.R.No	Purchase/Supply order		Description of materials	Stores code No	Quantity		Unit	Rate	Amount
			No	Date			Received	On check measurement			
1	2	3	4		5	6	7A	7B	8	9	10

APPENDIX XII (b)(Concl'd)

Incidental charges	Amount including incidental charges	Stores Ledger Folio No	Reference to payment voucher or adjustment to debit		Remarks including result of test check by superior officers
			No	Date	
11	12	14	15A	15B	16

Dated signature and Designation of the Officer entering measurements

1. A separate GRS should be prepared in respect of goods purchased from one supplier.
2. The articles falling under each sub-head of stock should be grouped together or entered on separate sheets.
3. The details of measurements, check measurements, incidental charges and immediate payments will be recorded on the reverse.
4. If GR sheets are prepared for part supplies reference will be made to previous G.R.S also in column 4.
5. Column 11 – Extra items as are payable to the supplier or as deductible towards expenses incurred by the department on the supplier's account on the basis of the conditions of the supply order or contract is intended to be included in this column.

Appendix 2900F

8.2.2

Register of goods received sheet (As per Para

2913.2)

Division.....Subdivision.....

Date of issue	Serial No of Booklet	Name and designation of the officer to whom issued	Signature of the officer to whom issued	Date of receipt in the Division	Remarks
1	2	3	4	5	6

Appendix 2900G

8.2.3 Stores Indent (As per Para 2913.4)

No.....Stores indent onDivision

Date.....Name of work/job.....

Division.....Name of contractor from whom value recoverable.....

Subdivision.....

Head of Account.....

S L N o	Description of article	Code No	Quantity indented		Quantity issued		Unit	Rate	Value	Remarks
			In figures	In words	In figures	In words				
1	2	3	4(a)	4(b)	5(a)	5(b)	6	7	8	9

Received the articles as per column 5 (b). Please deliver the articles to the person whose specimen signature is given below.

Name and address of the person to whom the article are to be delivered (Specimen Signature of the above person) Signature (with date) of the Indenter (Designation).....
---	---

Passed for issue (furnish details of the items and quantities not passed as per column 4)

Signature of Divisional /
Sub divisional Officer

Issued on..... and entered in Register..... Gate pass No & Date Signature of Assistant Executive Engineer Store Keeper	Received the quantity as per column 5 (b) Signature (with date) of the authorised person	Ledger folio No..... SI No of item Initials of 8.2.3.1 Ledger Keeper Divisional Accountant
---	--	--

Appendix 2900H

8.2.4

Stores Issue Receipt (As per Para 2913.4)

To
The Executive Engineer,
.....Division
.....

<p>Unstamped Receipt for Materials Issued Office copy Division Subdivision Book No Receipt No Subdivision.....Date Name of contractor..... Name of work Agreement No Stores Indent No Date on Division. Initials of Junior Engineer (in charge of work) issuing the materials.</p>	<p>Unstamped Receipt for Materials Issued Copy for Executive Engineer Division Subdivision Book No Receipt No Subdivision.....Date I hereby acknowledge receipt from .....of the materials noted on the reverse for the work of as per agreement No and bind myself not to use the same for any other purposes and the same shall remain the property of Government until used for the said work. I shall also accept such corrections in rates noted overleaf as are found necessary, in accordance with that terms of the agreement. Signature of the Contractor Signature of Issuer (Dated)</p>	<p>Unstamped Receipt for Materials Issued Copy to be returned to original office by Executive Engineer Division Subdivision Book No Receipt No The receipt has been posted in .....Contractor's ledger Vol.....Folio..... with alterations noted overleaf <hr/>no alterations Executive Engineer Divisional Accountant (to be returned to the Issuer)</p>
<p><i>Note:</i> Rate to be noted should be the recovery rate as per agreement</p>	<p><i>Note:</i> Rate to be noted should be the recovery rate as per agreement</p>	
<p>Obtained from .....Stores as per Indent No.....Dated..... Sl. No... Particulars Standard unit Quantity (In figures) (In words) Rate Value</p>	<p>Obtained from .....Stores as per Indent No.....Dated..... Sl. No... Particulars Standard unit Quantity (In figures) (In words) Rate Value Submitted to Executive Engineer, Subdivisional Officer</p>	<p>Obtained from .....Stores as per Indent No.....Dated..... Sl. No... Particulars Standard unit Quantity (In figures) (In words) Rate Value</p>

Posted into Contractor's ledger
Vol.....Folio.....

Executive Engineer
.....Division

Appendix 2900I

8.2.5 Stock Ledger (As per Para 2918.1)

Date	nature of article	Identifying Number	Opening Balances as per last Physical Verification	Receipt	Total (4+5)	Issues upto date	Closing book balance as on (Column 6-7)	Counted balance	Differences (Column 8-9)	condition of the article	dated initials of custodian of stores	dated initials of the stock Verifier
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

Appendix 2900J

Progress report (As per Para 2918.1)

Progress Report of Stock Verifier Shri..... as on

Name of Project Store	Identifying Number	Name of Article	Book Balance			Counted balance			Condition of Article	Difference				Explanation of Stores Officer
			date	Quantity	Value	date	quantity	Value		Excess		Shortage		
										Quantity	Value	Quantity	Value	

Custodian of Stores or Store Officer
Stock Verifier

Appendix 2900K

8.2.6 Register of dismantled materials (As per Para 2918.3)

Division.....

Subdivision.....

Sl No	Date of receipt	Reference to No and page No of measurement book	Full particulars of materials giving size etc if any	Opening balance	Quantity received	Total	Reference to its disposal whether by write off or transfer to other works	Quantity issued or disposed off	Closing balance	Dated initials of the Assistant Engineer	Date of verification of balances and by whom verified	Remarks
	2	3	4	5	6	7	8	9	10	11	12	13

**GOVERNMENT OF KERALA
PUBLIC WORKS DEPARTMENT**



**QC/QA MANUAL FOR
MINOR AND MEDIUM WORKS**

CONTENTS

1. Abbreviations

2. Introduction

3. Quality system

4. General Quality Requirements

Appendix A (Test Frequencies)

Appendix B (Summary of MORT&H Requirements)

Appendix C (Concrete Requirements)

SECTION 1
ABBREVIATIONS

AE	Assistant Engineer
AEE	Assistant Executive Engineer PWD
BM	Bituminous Macadam
BUSG	Built Up Spray Grout
CE	Chief Engineer PWD
EE	Executive Engineer PWD
GoK	Government of Kerala
IPC	Interim Payment Certificate (Certification of each bill)
IRC	Indian Roads Congress
JE	Junior Engineer/Overseer
MORT&H	Ministry of Road Transport and Highways
OGL	Original Ground Level
PCC	Portland Cement Concrete
PWD	Public Works Department Kerala
QA	Quality Assurance
QC	Quality Control
RCC	Reinforced Cement Concrete
SDBC	Semi Dense Bituminous Macadam
SE	Superintending Engineer
WBM	Water Bound Macadam
WMM	Wet Mix Macadam

SECTION – 2

INTRODUCTION

This Quality Control/Quality Assurance manual is designed for projects for minor works as a foundation for the development of QA as set out in IRC SP57.

Quality Assurance is defined as the process to ensure the product is “fit for the purpose for which it was intended”

Quality Control is “the techniques/tests for controlling quality”

In this manual the parties to the Contract are required to ensure that documentary evidence of conformance to the contract is demonstrated.

The general principle to be adopted is that the Contractor is to provide documentary evidence that work conforms to the Contract and the Engineer is to check and randomly audit the evidence supplied by the Contractor.

The Contractor is required to meet the prequalification requirements of the PWD for the type of work specified.

Quality Control/Quality Assurance should not only lead to improved quality and uniformity but should also lead to more economical utilization of materials and a reduction in cost to the contractor, user costs, cost of vehicle operation, transportation and maintenance. The basic idea is that the contractor has to perform the necessary tests and inspection to ensure that all the works in road construction meet the specification. The Contractor is responsible for the work from the beginning till the final acceptance of all the works and the expiry of any defects liability period.

Quality is required at all stages of the project whether it is buildings, bridges, small culverts, design, traffic control, safety etc.

For instance, the stages of control in a road project are

- (a) Preliminaries
- (b) during earthwork
- (c) sub base courses
- (d) base courses
- (e) surface courses.

During the preliminary stage the contractor is to take such steps as are necessary to comply with environmental, social and safety requirements of the job.

Quality materials and workmanship are required at all stages.

Similar stages of construction can be set for buildings, bridges, and other types of construction.

Bitumen carpet overlaying and construction along with sprayed bitumen chip sealing are specialist procedures and require specialist equipment and skills.

Concrete works are considered separately under this quality manual

The Contractor is responsible to obtain test results to verify the work complies with the specification. Test results which show material and workmanship comply with the specification are to be submitted with each bill and will be scrutinized for conformance before an Interim Payment Certificate is issued.

SECTION – 3

QUALITY SYSTEM

The items covered by this manual are an introduction to Quality Assurance as defined in IRC SP57.

3.1. Quality System

The Contractor shall have in place a documentary system which verifies the works conform to the Specification

3.2. Contract Review

The Contractor shall demonstrate understanding of the Contract requirements and record resolution of any ambiguities or differences in a timely manner

3.3. Design Control

The Contractor shall check that the design of any temporary or permanent structures proposed by the Contractor (formwork, concrete mixes, traffic control, detours, etc) comply with the relevant Code of Practice and submit to the Engineer for approval. Approval by the Engineer does not absolve the Contractor from liability for the design submitted.

3.4. Document Control

The Engineer and the Contractor shall have in place a satisfactory document control system that records activities of the works, correspondence, all contract documentation. All Contract documents, Drawings, variations, instructions, claims and correspondence will be kept in an easily retrievable and secure system.

3.5. Purchasing

Purchased products shall have documentary evidence to verify conformance with the Contract. Current complying manufacturer's or supplier's certificates shall be acceptable as evidence of conformance. In the absence of manufacturers certificates sampling must be done and test results provided. For Minor Works up to 15 lakhs no testing is required for materials purchased from PWD approved sources or where manufacturers certificate supplied.

3.6. Control of Customer (Employer) Supplied Product

The Contractor shall have in place means to ensure that product supplied by the Employer is handled in accordance with the specification

3.7. Traceability

Documentary evidence of where supplied products are incorporated in the works shall be kept (e.g. Location of materials in the job can be recorded on delivery bills).

3.8. Process Control

The Contractor shall provide documentary evidence of the work processes to be used in carrying out the works. These shall be in the form of job instructions or manuals which describe the procedures for completing the works.

3.9. Inspection and Testing

Test results shall be submitted with each bill to verify the works comply with the specification. In the absence of test results, cover up work shall not proceed. Measurement of works shall be jointly agreed between Contractor and PWD.

3.10. Control of Inspection, Measuring and Testing Equipment

The Contractor will ensure that all equipment used to construct the work is calibrated and accurate. The Contractor will ensure that testing is carried out by laboratories PWD approved.

3.11. Inspection and Test status (Materials and Completed works)

The Contractor shall document all tests and non conformances

3.12. Control of non-conforming work

The Contractor shall document and ensure that non- conforming work is:

- Reworked to meet the specification
 - (ie low compaction rectified by further rolling)
- Accepted with or without repair with concession
 - (ie material accepted with a deduction in payment)
- Re-graded for alternative use
 - (ie material that is unsuitable for pavement utilized in embankment where it conforms)
- Rejected and scrapped
 - (ie material that has no use anywhere is removed and taken from site)

3.13. Corrective and Preventive Actions

The Contractor shall assess non-conforming work and ensure a process of corrective and preventive measures to eliminate the root cause of non-conformances.

3.14. Handling storage Packaging, Preservation and Delivery

The Contractor shall manage storage of goods as per the specification

3.15. Control of Quality records

The Contractor shall maintain a secure documentation system to enable Quality records to be retrieved as necessary.

3.16. Internal Quality Audits

The Contractor shall carry out regular self-checking to ensure the documentation and work procedures and the works comply with the Contract and Specification

3.17. Training

The Contractor shall implement training programs to ensure all employees and subcontractors are skilled for the work which they are to perform.

3.18. Safety, Environment and Social

The Contractor shall carry out the work in a safe and environmentally responsible manner in accordance with the Contract and Specification. Safety and Environmental checklists and self-checking shall be conducted and documented on a regular basis.

SECTION - 4

GENERAL QUALITY REQUIREMENT

All work shall comply with the requirements of the Contract and be in accordance with the specification and the relevant clauses of the latest edition of the MORT&H Specifications for Roads and Bridge Works. Where there are Special Conditions these shall take precedence over MORT&H specifications

The Contractor will carry out the works in a responsible and orderly fashion with least disruption to the public and in accordance with the Safety, Environmental, and Social requirements of the Contract. Adequate provision in accordance with the Contract requirements shall be provided for the safe movement of traffic and people through the work site. Barrier boards, traffic signs, traffic bollards and mesh etc. in accordance with IRC SP55 for temporary signs and IRC SP67 for permanent signs shall be provided to maintain safety for the public.

The Contractor shall arrange and pay for tests carried out at the frequencies specified in Appendix A . Test results must accompany the relevant bill to verify that work completed complies with the requirements of the Contract. Tests shall be carried out at laboratories approved by the Engineer which have calibrated equipment and skilled personnel capable of carrying out the desired test in accordance with the relevant IS Codes.

4.1 Minor Works up to 15 lakhs:

Provided materials used in the works are purchased from PWD approved sources no tests are required.

4.2 For Medium Works 15 Lakhs to 100 Laks:

For medium works the following tests are required.

1. Grading of Aggregate.
2. Atterberg's Limits(Plasticity Index)
3. CBR for subgrade.
4. Marshall Tests on asphalt.

5. Concrete Compressive Strength – Slump.

6. Field Density of Soils.

Where available current manufacture's or suppliers certificates are acceptable. Testing frequencies shall be as per Appendix 'A'

4.3. Preliminaries:

Prior to starting work on site the Contractor shall demonstrate understanding of the scope of the work by submitting a program in a form approved by the Engineer showing that the work will be completed within the Contract period.

4.4. Earthworks

The Contractor will submit Natural Ground Level (Initial level) of existing surface for approval by the Engineer. Contractor shall not start the work until after the level of existing surface is approved by the engineer . Submission of underlying levels after commencement of subsequent layers will not be acceptable.

4.5. Sub-base, Base and Wearing course

Sub-base, base and wearing course will be constructed in accordance with the terms of the Contract and imported material shall be obtained from sources approved by the Engineer. The Contractor shall provide copies of test results with each relevant bill to verify that all material used and workmanship complies with the specification

4.6. Concrete

Concrete shall conform to the requirements of the contract and the Contractor shall supply test results with each relevant bill to verify concrete conforms to the Contract and specification requirements.

4.7. Maintenance (Performance based Contracts)

Where maintenance is carried out by Performance Based Contracts the maintenance shall be carried out at the specified intervention levels and the Contractor and Engineer shall carry out joint inspections prior to each relevant bill to verify that maintenance is within the agreed intervention level and rectification standard. (ie potholes >150mm diameter to be repaired withinspecified time).

In other cases, ie for schedule of rates contracts, the maintenance shall be at the agreed jointly measured quantities priced at the Contract schedule of rates

Appendix A (Testing Frequencies)

A.1. Embankment/ Subgrade

Item	Method	Frequency	Specification	Engineer's Audit Check Frequency
Plasticity Index	IS 2720 Part 5	2 tests per 3000 m ³	<45%	To check at least 15% of the tests during execution.
Liquid Limit	IS 2720 Part 5	2 tests per 3000 m ³	<70%	To check at least 15% of the tests during execution.
Free - Swelling Index	IS 2720 Part 5	As required	<50%	To check at least 15% of the tests during execution.
Maximum Dry Density (Proctor)	IS 2720 Part 8	2 tests per 3000 m ³	1.52gm/cc(min) for embankment 1.75gm/cc(min) for subgrade	To check at least 15% of the tests during execution.
CBR Value	IS 2720 Part 16	1 tests per 3000 m ³	>5% for embankment >8% for subgrade	To check at least 15% of the tests during execution.
Field Density	IS 2720 Part 8	2 tests per 3000 m ³	97% for subgrade 95% for embankment	To check at least 15% of the tests during execution.

A.2. Granular Sub-Base

Item	Method	Frequency	Specification	Engineer's Audit Check Frequency
Liquid Limit	IS 2720 Part 5	1 tests per 200 m ³	<25%	To check at least 15% of the tests during execution
Plasticity index	IS 2720 Part 5	1 tests per 200 m ³	<6%	To check at least 15% of the tests during execution.
10% Fines Value	BS 812, Part III	1 tests per Source	>50 KN	To check at least 15% of the tests during execution.
Water Absorption	IS 2727 Part 7	1 tests per Source	<2%	To check at least 15% of the tests during execution.

Maximum Dry Density	IS 2720 Part 8	2 tests per 1000 m ³	-	To check at least 15% of the tests during execution.
CBR Value	IS 2720 Part 16	1 tests per 3000 m ³	As per Grading	To check at least 15% of the tests during execution.
Sieve Analysis	IS 2386 Part 1	1 tests per 100 m ³	As shown in table A.3 below	To check at least 15% of the tests during execution.

A.3. Grading requirement for Granular Sub-Base

Sieve size (mm)	Specification limits (percent passing)		
	Grading I	Grading II	Grading III
75	100	-	-
53	80-100	100	-
25.5	55-90	70-100	100
9.5	35-65	50-80	65-95
4.75	25-65	40-65	50-80
2.36	20-40	30-50	40-65
0.425	10-25	15-25	20-35
0.075	3-10	3-10	3-10
CBR	30	25	20

A.4. Wet Mix Macadam&Non Bituminous Base Course

Item	Method	Frequency	Specification	Engineer's Audit Check Frequency
Los Angeles abrasion	IS 2386, Part 4	1 test per 200 m ³	<40%	To check at least 15% of the tests during execution
Combined flakiness index	IS 2386 Part 1	1 test per 200 m ³	<30%	To check at least 15% of the tests during execution
Atterberg limits	IS 2720, Part 5	1 test per 100 m ³	-	To check at least 15% of the tests during execution
Plasticity index	IS 2720 Part 5	1 tests per 200 m ³	<6%	To check at least 15% of the tests during execution.

Water Absorption	IS 2727 Part 7	1 tests per Source	<2%	To check at least 15% of the tests during execution.
Maximum Dry Density	IS 2720 Part 8	2 tests per 1000 m ³	-	To check at least 15% of the tests during execution.
Sieve Analysis	IS 2386 Part 1	1 tests per 100 m ³	As shown in MORT&H table 400-11	To check at least 15% of the tests during execution.
Field Density	IS 2720 Part 28	1 tests per 500 m ²	98% of Maximun Dry Density	To check at least 15% of the tests during execution.

A.5. Bituminous Macadam & Other Bituminous Base Course

Item	Method	Frequency	Specification	Engineer's Audit Check Frequency
Quality of Binder	IS 73, IS 217, IS 8887	1 tests per lot	60/70 unless otherwise Specified	To check at least 15% of tests during execution
Los Angeles abrasion	IS 2386, Part 4	1 test per 50 m ³	<40	To check at least 15% of the tests during execution
Flakiness and Elongation	IS 2386 Part 1	1 test per 50 m ³	<30%	To check at least 15% of the tests during execution
Soundness	IS 2386, Part 5	1 test per 50 m ³	<12 for NgSO ₄ <18% for MgSO ₄	To check at least 15% of the tests during execution
Stripping test	IS 6241	1 test per 100 ³	>95%	To check at least 15% of the tests during execution.
Absorption	IS 2720 Part 8	3 tests per Source	<2%	To check at least 15% of the tests during execution.
Grading of Aggregates	IS 2386 Part 1	1 test per 25 m ³	As per job mix formula	To check at least 50% of the tests during execution.
Density of compacted layer	ASTM-D 1559	1 test per 250 m ²	As per MORT&H Section 900	To check at least 15% of the tests during execution.

A.6. Concrete

Item	Method	Frequency	Specification	Engineer's Audit Check Frequency
Aggregate Impact Value	IS 2386	1 tests per lot	<30%	To check at least 15% of tests during execution
Los Angeles abrasion	IS 2386, Part 4	1 test per 50 m ³	<40%	To check at least 15% of the tests during execution
Flakiness and Elongation	IS 2386 Part 1	1 test per source	<35%	To check at least 15% of the tests during execution
Specific Gravity	IS 2727 Part 8	1 test per Source	-	To check at least 15% of the tests during execution
Absorption	IS 2720 Part 8	1 test per Source	<2%	To check at least 15% of the tests during execution.
Soundness	IS 2386, Part 5	1test per source	<12 for NgSO ₄ <18% for MgSO ₄	To check at least 15% of the tests during execution
Grading of Aggregates	IS 2386 Part1	1 test per source	As shown In Appendix C	To check at least 15% of the tests during execution.
Compressive Strength	IS 516	As per the table below	As per the table below	As per the table below

Compressive strength of the concrete shall be tested in accordance with IS 516. Three test specimens of 150mm cubes (cubes shall be prepared as per IS 1199) shall be made, cured and tested at the age of 28 days for compressive strength in each samples. The minimum frequency of sampling of concrete of each grade shall be as per the following table.

Quantity of Concrete in Work, M ³	No. of Samples	Acceptance Criteria
1 - 5	1	<ul style="list-style-type: none"> The mean strength determined from any group of four consecutive samples should exceed the specified characteristic compressive strength. Strength of any sample is not less than the specified characteristic compressive strength minus 3 Mpa.

Appendix B (Road Works)

Specification – General requirements (Refer to relevant clauses of latest edition of MORT&H Specifications for Roads and Bridges for full descriptions)

List of typical equipment that needs to be checked/calibrated

Item	What needs to be checked	Comments
Level	Line of collimation	
Measuring tapes	Accuracy against standard	
Rollers	Drums are smooth and round	
PTR rollers	Tyre pressure is correct	
Graders	Blades are straight	
Pavers	Boards are flat segments are aligned and angle of attack correct hydraulics smooth	
Trucks	Mechanically sound, tyres at correct pressure	
Thermometers	Checked against standard	
Weigh-Scales	Calibrated with standard weights	
Laboratory equipment	Must all be checked against standards (see IRC codes)	

B.1. Requirements of Materials for Earth Work

The material used for embankment/subgrade construction can be from roadway excavation or from borrow pits.

The essential physical requirements of embankment/subgrade materials are (a) size of coarse material: max 75 mm for embankment and max 50mm for subgrade (b) liquid limit: max 70% (c) free swelling index: max 50% (d) plasticity index: max 45% (e) maximum dry density(MDD): minimum 1.52 gm/cc (f) CBR value: minimum 5% for embankment and 8% minimum for subgrade (g) thickness of each compacted layer should not be more than 200 mm. (h) field density: 95% of MDD for embankment layers and 97% of MDD for subgrade layers.

B.2. Requirements Of Materials For Sub-Base

The material to be used for sub-base work shall be natural sand, moorum, gravel, crushed stone or combinations thereof depending upon the grading requirement for that refer either **Table No 400-1** or **Table No 400-2** of **MORT&H** specifications.

The physical requirements of the materials for sub-base are (a) 10 per cent fines value in soaked condition: min 50 KN (b) water absorption: max 2%.

B.3. Base Course

Physical Requirements of Aggregates (WBM)

The requirements for aggregates used are (a) Los Angeles abrasion value :max 40% (b)Aggregate impact value max 30% (c) combined Flakiness and Elongation index : max 30%.

The grading requirement of the aggregate used is given below

TABLE – B.3.1

Grading No	Sieve range	Sieve size (mm)	% by weight passing
1	90-45	125	100
		90	90-100
		63	25-60
		45	0-15
		22.4	0-5
2	63-45	90	100
		63	90-100
		53	25-75
		45	0-15
		22.4	0-5
3	53-22.4	63	100
		53	95-100
		45	65-90
		22.4	0-10
		11.2	0-5

For WMM grading refer **Table 400-11** of **MORT&H** specification.

Aggregates with bricks, kankar, laterite, etc. which get softened in presence of water shall be tested for impact value under hot conditions in accordance with IS 5640. Flakiness index and elongation index shall be enforced only in case of crushed broken stone and crushed slag and the combined flakiness and elongation shall not exceed 30%.

The screenings used to fill the voids have to satisfy gradation given below. When gravel is used the liquid limit should be less than 20 and the plasticity index less than 6%. Percent passing 75-micron sieve should not be more than 10%.

TABLE –B.3.2

Grade classification	Size of screening(mm)	Sieve size (mm)	% By weight passing
A	13.2	13.2	100
		11.2	95-100
		5.6	15-35
		180mc	0-10
B	11.2	11.2	100
		5.6	90-100
		180mc	15-35

B.4. Bituminous Macadam

The physical requirement of aggregate used for bituminous macadam are (a) Los Angeles abrasion value max 40% (b) aggregate impact value : max 30% (c) flakiness and elongation (total):max 30% (d) water absorption : max 2% (e) soundness : max loss of weight 12% for sodium sulphate and 18% for magnesium sulphate.

The grading requirement as follows

TABLE –B.4.1

IS sieve designation	Per cent by weight passing sieve	
	Grading-1	Grading-2
45.0 mm	100	
26.5 mm	75-100	100
22.4 mm	60-95	75-100
11.2 mm	30-55	50-85
5.6 mm	15-35	20-40
2.8 mm	5-20	5-20
90 microns	0-5	0-5

Bitumen content for pre mixing shall be 3 to 3.5 per cent by weight of total mix. The maximum compacted layer thickness shall be 100 mm. Bituminous macadam mix shall be prepared in a hot mix plant of adequate capacity.

Temperature

For binder at the time of mixing : 150-163 Degrees

For aggregate at the time of mixing : 155-163 Degrees

For mix at the plant : 130-160 Degrees

For laying at site : 120-160 Degrees

Rolling operation shall be completed before temperature of mix falls below 100 degrees.

B.5. Bituminous Penetration Macadam

The physical requirements of aggregates shall be the same as that of bituminous macadam.

The grading requirement as follows

TABLE –B.5.1

IS Sieve Designation	Per cent by weight passing sieve			
	For 50 mm compacted thickness		For 75mm compacted thickness	
	Coarse aggregate	Key aggregate	Coarse aggregate	Key aggregate
63 mm			100	
53 mm				
45 mm	100		58-82	
26.5 mm	37-72			100
22.4 mm		100	5-27	50-75
13.2 mm	2-20	50-75		
11.2 mm				5-25
5.6 mm		5-25		
2.8 mm	0-5	0-5	0-5	0-5

Quantities of materials required for 10 sq.m area for bituminous penetration macadam is given below.

TABLE –B.5.2

Compacted thickness	Binder	Coarse aggregate	Key aggregate
	Straight run bitumen		
50 mm	50 kg	0.60 cu.m	0.15 cu.m
75 mm	68 kg	0.90 cu.m	0.18 cu.m

Dry and clean coarse aggregate shall be spread uniformly and evenly at the rate specified by the above table. After the coarse aggregate has been rolled and checked, the bituminous binder shall be applied at specified temperature, the rate of application given in the above table.

Immediately after the first penetration of bitumen, key aggregate in a clean and dry state shall be spread uniformly over the surface by means of an approved mechanical spreader at the rate specified in the above table and rolled in accordance with the specification.

B.6. Seal Coat

Seal coat of two types (see MORT&H clause 513)

(a) Type-A- Chip Sealing seal coat comprising of an application of a layer of bituminous binder followed by a cover of stone chippings.

(b) Type-B- Premixed seal coat comprising of thin application fine aggregate premixed with bituminous binder.

Physical requirement of aggregate

Type-A- the aggregate shall satisfy all the physical requirements of aggregate

for bituminous macadam except for water absorption which shall be less than 1%. Stone chippings shall be of 6.7 mm size defined as 100% passing through 11.2 mm sieve and retained on 2.36 mm sieve. The quantity used for spreading shall be 0.09cum/10sq.m.

NOTE : The contractor is responsible to ensure that the surface seal coat does not strip, ravel, flush or bleed. Spray rates for bitumen & spread rates for aggregate chips must be adjusted to allow for the effects of traffic and size and quality of aggregate chip etc.

Type-B- The aggregate shall pass through 2.36 mm sieve and be retained on 180-micron sieve .The quantity used for premixing shall be 0.06 cum/10sq.m.

B.7. The spray rate of bitumen for bituminous works is detailed below

a) For Tack Coat

Normal bituminous surface : 2 to 2.5 kg/10 sq.m

Dry/hungry surface : 3.5 to 4 kg/10 sq.m

Note : There is no need for tack coat on freshly laid bituminous surfaces if overlaid on same day without opening to traffic.

- b) Requirement of **sprayed bituminous chip sealing** for surface dressing

Spray rates for bitumen and spread rates for aggregate chips depends on traffic, aggregate chip size, bitumen temperature, and penetration etc and shall be checked with the Engineer before sprayed chip sealing is attempted

B. 8. Built Up Spray Grout (See IRC47)

The grading requirement is given below are percentage by weight passing the sieve.

TABLE –B-7.1

IS Sieve (mm)	Coarse Aggregate (mm)	Key aggregate (mm)
53	100	
26.5	40-75	
22.4		100
13.2	0-20	40-75
5.6		0-20
2.8	0-5	0-5

Requirement of bitumen

First : 15 kg/10sq.m
 Second : 15 kg/10sq.m

Coarse aggregate is spread uniformly at the rate of 0.5-cum/10sq.m areas over a tack coat and

inder is applied at 15kg/10sq.m area. Immediately after key aggregate is spread uniformly at 0.13 cum/10sq.m area and rolled, brooming. whenever required for uniformity. Then the final surface has to be provided without delay .If there is delay, a seal coat should be provided as an intermediate step.

B.9. Semi-Dense Bituminous Carpet (MORT&H Clause 508)

Aggregate water absorption 1% (max)

Binder content: Minimum 4% of mix by weight.

Gradation requirements are given below

TABLE –B.8.1

Grading	1	2
Nominal aggregate size	13mm	10mm
Layer Thickness	35 – 40mm	25 -30mm
IS Sieve ⁺ (mm)	Cumulative % by weight of total aggregate passing	
19	100	
13.2	90 - 100	100
9.5	70 - 90	90 - 100
4.75	35 - 51	35 - 51
2.36	24 - 39	24 - 39
1.18	15 - 30	15 - 30
0.3	9 - 19	9 - 19
0.075	3 - 8	3 - 8
Bitumen content % by mass of total Mix [#]	Min. 4.5	Min 5.0
Bitumen grade	65*	65*

Notes:

+ The combined aggregate grading shall not vary from the low limit on one sieve to the high limit on the adjacent sieve.

Determined by the Marshall method.

* Only in exceptional circumstances, 80/100 penetration grade may be used, as approved by the Engineer.

Requirement of mix

Marshall stability : 8.2 KN

(samples compacted with 75 blows)

Marshall flow : 2 to 4 mm

Percent air voids in mix : 3 to 5

Percent air voids in aggregates : 13 to 15 (minimum)

(13.2 mm max size)

Percent voids in mineral aggregate

Filled with bitumen (VFB) : 65 to 78

Binder content : 4% minimum

Temperature of mix at laying : 120 to 160 degree C

Minimum temperature for rolling : 90 °C

B.10. Field Tests for Bituminous works

No bituminous work shall be carried out when the atmospheric temperature is less than 16 degree and when the base or the construction materials are damp. The thickness of the layer can be checked at frequent intervals after compaction by using pre decided depth blocks. Rolling should continue till the roller marks are eliminated. Rolling temperature should not fall below 100 degree.

It is necessary to conduct tests at frequent intervals during the work to find out whether the prescribed bitumen quantity is being used in the work. For this a simple field solubility test can be conducted (for field control) as follows.

About 1 kg of the mix is collected and weighted accurately. The sample is immersed and flushed in either carbon di-sulphide or carbon tetra chloride liquids (both chemicals are highly toxic and should only be used in a fully vented fume cupboard). Kerosene can also be used for the purpose. Since the bitumen is completely soluble in these solvents except for negligible quantities of impurities like carbon ,salts, etc. the weight of aggregates without the bitumen can be obtained to arrive at the difference in weight, which represents the weight of bitumen used in the mix.

B.11. Marshall Stability Test

The Marshall stability test shall be used to determine bituminous concrete mix proportions and to test the product delivered to the job. Mix shall be approved by the Engineer prior to use in the works.

B.12. Other Control Measures

The camber of the laid surface should be checked by means of camber board and spirit level. Triangular wedges may be used for finding out depressions under a 3 metre straight edge. Maximum allowable depression is 6mm. Templates may also be prepared to check the cambers at different locations. The longitudinal alignment should be checked by a straight edge and triangular wedge.

Traffic on the fresh surface should not be allowed until the mix has become cool enough to prevent wheel-marking by traffic.

B.13. Standards of surface evenness

The surface unevenness should be controlled during construction so that both longitudinal and cross profiles are simultaneously satisfied. The maximum number of undulations permitted in any stretch of 300 meters length is 30 and in the cross profile ,it is 6 only. The details of the permitted tolerance of surface regularity of pavement courses are given as under.

Permitted tolerances of surface regularity for pavement courses

TABLE –B.10.1

No.	Type of construction	Max permissible undulations (mm)	Longitudinal profile with 3m straight edge				Cross Profile
			Max no of undulations permitted in 300m exceeding				Max permitted variations from specified profile under camber template
			18 mm	12 mm	10 mm	6 mm	
1	Earth subgrade	24	30				15
2	Sub base	15		30			12
3	WBM with 40mm 90mm rolled	15		30			12
4	WBM with 20-50mm of 40-63mm size BPM or BUSG	12			30		8
5	Surface dressing	12			20		8
6	Open graded premix carpet mix seal surfacing	10				30	6
7	Bituminous macadam	10				20	6
8	Semi dense carpet	10				20	6
9	Asphalt concrete	8				10	4

Surface level even-ness shall be in accordance with table 900-1 of MORT&H Specification for Roads and Bridges. Surface even-ness may be measured by 3m straight edge and wedges or by other acceptable means approved by the Engineer

B.14. Road Maintenance works

Depending on the standards of original construction, change in traffic intensity, climatic conditions etc., maintenance of roads presents problems of different nature. A systematic approach involving sequential operations is necessary.

The different items of maintenance works being carried out fall under three headings

- Routine maintenance: including filling up potholes, patches, repairs to side berms, improving surface drainage, cleaning choked culverts, painting sign boards etc.
- Periodical maintenance: including surface renewals (ie re-gravelling) and strengthening by way of providing overlays and
- Rectification/upgradation: including widening of roads, improvement of CD works, improved drainage measures, providing new sign boards etc.

B.14.1. Routine Maintenance

B.14.1.1. Potholes

The occurrence of potholes is the most common phenomenon observed especially after rains. These can be the result of but not limited to:

- (a) ingress of water into the pavement through cracks,
- (b) ingress of water by surface ponding because of insufficient surface camber or superelevation.
- (c) lack of bond between the surfacing and the base course and
- (d) use of insufficient bitumen in the surfacing etc

Patching of these potholes has to be executed with care to make it successful.

The potholes should be cut as nearly as possible to the shape of a rectangle, sides being vertical. All loose material shall be cleaned out. If there are deep pot holes as a result of improper drainage or existence of soft pocket in the subgrade, these should be dug out down to solid subgrade, and made good with well-graded aggregate. In WBM roads, the potholes should be filled with aggregates and screenings as specified for WBM and compacted with heavy hand rammers. In asphalt roads, the bottom and sides of the potholes duly trimmed to a rectangular shape should be coated with bitumen emulsion (using a sprayer or by brushing) and filled with premix. The premix should be compacted in layers of 25mm at a time, the hand rammers being dipped in water often so that the coated metal may not stick to it. The finished surface should be compacted level with (not below, but in any case no more than 5mm above) the surrounding road surface.

B.14.1.2. Shoulder Grading

Shoulders must be graded to slope away from the carriageway such that water can flow across the shoulder and not run along the pavement adjacent to the carriageway.

B.14.1.3. Grass Cutting-Jungle Clearance

Grass shall be cut as per the specified interval debris removed from the site

B.14.1.4. Repairs To Headwalls Etc

Headwalls to culverts and masonry to side drains etc shall be repaired using the same techniques as used in the original structure. Materials used shall be of sound quality according to the specification and construction shall be in accordance with the best practice techniques

B.14.2. Periodic Maintenance

Periodic maintenance such as BT overlays or Bitument Chip Sealing surface dressing, or re-gravelling shall be carried out in accordance with the schedules prepared by the RMMS system. Materials and workmanship shall be in accordance with the Contract and Specification.

B.14.2.1. Profile Corrective Courses

Where the maximum profile corrective course thickness works out to not more than 40 mm, it shall be done as an integral part of the average course. In other cases, the profile corrective courses shall be provided as a separate layer.

Potholes have to be filled before profile corrective course is laid.

Profile corrective course shall be measured as volume compacted in position. The volume shall be worked out by survey control, plotting the exact profile corrective course as built up at site and super imposed on the existing pavement profile.

B.14.2.2. BT Carpet

BT Carpeting shall be in accordance with the specification and must be manufactured at 150° C and laid in accordance with clauses B9 to B13.

B.15. Bituminous Testing:

The control tests to be conducted on bituminous works are listed below for ready reference.

1. SDBC:
 - a) Quality of binder
 - b) Aggregate impact value
 - c) Flakiness and elongation index
 - d) Stability of mix – Marshall test for stability, flow value,

- Density and void content
 - e) Binder content
 - f) Temperature
2. BUSG/Bituminous penetration macadam
- a) Quality of binder
 - b) Aggregate impact value
 - c) Flakiness and elongation index
 - d) Aggregate grading
 - e) Binder content
 - f) Temperature
3. Tack Coat/Prime Coat:
- a) Quality of binder
 - b) Rate of spread
 - c) Temperature
4. Seal coat:
- a) Quality of binder
 - b) Aggregate impact value
 - c) Flakiness and elongation indices
 - d) Grading of aggregates
 - e) Average Least Dimension of Chips
 - f) Rate of spread
 - g) Temperature
5. Bituminous Macadam:
- a) Quality of binder
 - b) Aggregate impact value
 - c) Flakiness and elongation index

- d) Stability of mix – Marshall test for stability, flow value, Density and void content
- e) Binder content
- f) Temperature
- g) Stripping value
- h) Rate of spread of mixed material
- i) Water absorption
- k) Grading of aggregate

For all these following tests are also required

- a) Temperature to be measured at regular intervals.
- b) Depths of bituminous layers measured at regular intervals.
- c) Tests to determine the bitumen content in a mix at regular intervals.
- d) Check on camber and profile.

B.16. Acceptance

The Contractor is responsible for the sample collection, testing and submission of the test result to the Engineer along with each relevant bill. After the submission of test result the Engineer may authorise the payment of the work if it satisfies the specification requirement. If the test results do not satisfy the specification requirement the Contractor shall propose a method of corrective action for approval by the Engineer and provide conforming work at his own cost.

Appendix C (Structural Works)

Concrete Works

C.1. Aggregate

a) Coarse aggregate

For plain and reinforced cement concrete works, coarse aggregate shall consist of clean, hard, strong, dense, non-porous and durable pieces of crushed stone, crushed gravel or a suitable combination thereof or other approved inert materials.

For every new source the following tests are to be conducted.

- a) Aggregate impact value (max 30%)
- b) Water absorption (max 2%)
- c) Los Angeles Abrasion Value (max 40%)
- d) Grading of aggregate
- e) Flakiness and Elongation index (max 35%)

The grading requirement of coarse aggregate as follows

TABLE C-1.1

IS Sieve Size	Per cent by weight passing the sieve		
	40 mm	20 mm	12.5 mm
63 mm	100		
40 mm	95-100	100	
20 mm	30-70	95-100	100
12.5 mm			90-100
10 mm	10-35	25-55	40-85
4.75 mm	0-5	0-10	0-10

b) Fine aggregate

The fineness modulus of fine aggregate shall neither be than 2.0 nor greater than 3.5.
The grading requirement are given below

TABLE C-1.2

IS Sieve Size	Per cent by weight passing sieve		
	Zone-1	Zone-2	Zone-3

10 mm	100	100	100
4.75 mm	90-100	90-100	90-100
2.36 mm	60-95	75-100	85-100
1.18 mm	30-70	55-90	75-100
600 micron	15-34	35-59	60-79
300 micron	5-20	8-30	12-40
150 micron	0-10	0-10	0-10

C.2. Cement

Cement to be used in works shall be any of the following

- a) Ordinary Portland cement, 33 grades confirming to IS 269
- b) Ordinary Portland cement, 43 grade confirming to IS 8112
- c) Ordinary Portland cement, 53 grade confirming to IS 12269

The manufacture's test certificate can be accepted. The Contractor must produce the manufacture's certificate for the relevant bill. If it is not available contractor must do tests at his own cost and submit the result to the Engineer.

C.3. Steel

The steel used for structural work shall confirm to **Table 1000-3** of **MORT&H** specifications.

The manufacture's test certificate can be accepted. If it is not available contractor must do tests at his own cost and submit the result to the Engineer.

C.4. Concrete mix design and sampling

Prior to construction, the contractor shall prepare a design mix in the case of 'Design Mix Concrete' or prepare a nominal mix in the case of 'Nominal Mix Concrete' and obtain approval from the Engineer before use. For PCC and small RCC works nominal mix design can be adopted, but for major RCC works and for the concreting of load bearing structures a design mix must be followed based on the criteria in clause 1704 of MORT&H Roads and Bridges Specifications. For the testing and characteristic strength refer **Table1700** MORT&H specification.

One set of sample (6nos of cube) shall be taken for every 50m³ or for the day's work.

C.5. Formwork

All formwork and the reinforcement contained in it shall be cleaned and made free from standing water, dust, snow or ice immediately before placing concrete.

C.6. Mixing, Transporting and Placing of Concrete

Concrete shall be mixed either in a concrete mixer or in batching plant as mentioned in the contract or approved by the Engineer. Hand mixing shall not be permitted. The mixer or plant shall be at an approved location considering the properties of the mixers and transportation arrangement available with contractor. The mixer plant shall be approved by the Engineer.

Concrete shall not be freely dropped in to place from a height exceeding 1.5 m. Concrete shall be deposited in horizontal layers to a compacted depth of not more than 450 mm and vibrated to eliminate honeycomb.

C.7. Curing

Exposed surfaces of concrete shall be kept continuously in a damp or wet condition or by covering a layer of sacks, canvas, hessian or similar materials and shall be kept constantly wet for a period not less than 14 days from the date of placing of concrete.

C.8. Finishing

Immediately after the removal of forms, exposed bars or bolts if any shall be cut inside the concrete and resulting holes filled with cement mortar.

C.9. Acceptance

The Contractor is responsible for the sample collection, testing and submission of test result to the Engineer with each relevant bill. After the submission of test result the Engineer can authorize the payment for the work if it satisfies the specification requirement. If the test results do not satisfy the specification requirement the Contractor shall propose a method of corrective action for approval by the Engineer, rectify the non-conformance, and provide conforming work at no extra charge.

**GOVERNMENT OF KERALA
PUBLIC WORKS DEPARTMENT**



**QC/QA MANUAL FOR
MAJOR WORKS**

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SECTION 1
ABBREVIATIONS

AE	Assistant Engineer
AEE	Assistant Executive Engineer PWD
BM	Bituminous Macadam
BUSG	Built Up Spray Grout
CE	Chief Engineer PWD
DBM	Dense Bituminous Macadam
EE	Executive Engineer PWD
GoK	Government of Kerala
GSB	Granular Sub Base
IPC	Interim Payment Certificate (Certification of each bill)
IRC	Indian Roads Congress
JE	Junior Engineer/Overseer
MDD	Maximum Dry Density
MORT&H	Ministry of Road Transport and Highways
NGL	Natural Ground Level
NMC	Natural Moisture Content
OGL	Original Ground Level
OMC	Optimum Moisture Content
PCC	Portland Cement Concrete
PWD	Public Works Department Kerala
QA	Quality Assurance
QC	Quality Control
RCC	Reinforced Cement Concrete
SDBC	Semi Dense Bituminous Macadam
SE	Superintending Engineer
WBM	Water Bound Macadam
WMM	Wet Mix Macadam

SECTION 2
INTRODUCTION
PROCEDURE 2.1

A good road network has an important bearing on the economic growth of a country. Consistency in the quality of road and the incorporation of quality as major attribute in the organization entrusted with the task of road construction, are of great importance. Quality of a product or service has many aspects and quality should conform to the customer's requirements, and this has become a focal point in project management.

In order to achieve the aim of building safe, serviceable, durable and economic roadways, the road structure should meet certain requirements. The characteristics that a structure should possess to fulfil these requirements have to be specified. The code of practice and the contract documents strive to achieve this by way of defining design criteria, practical rules, technical specifications, testing and acceptance criteria and workmanship. All these strategies implicitly depend upon human skills for their successful and reliable application which, eventually, determines the quality of roads and bridges. The basic desire to produce quality work is essential in the minds of all those connected with road construction/maintenance projects.

Quality Assurance is defined as all the planned and systematic activities implemented within the Quality System and demonstrated as needed, to provide adequate confidence that an object will fulfil the requirements. The Quality Management Manual provides a base document outlining policy, procedures, responsibilities, compliance, acceptance criteria and documentation.

The Contractor shall appoint a Quality Assurance Representative with responsibilities as outlined in Section 2.6

2.1.1 Quality System

The Contractor shall have in place a documentary system which verifies the works conform to the Specification

2.1.2. Contract Review

The Contractor shall demonstrate understanding of the Contract requirements and record resolution of any ambiguities or differences in a timely manner

2.1.3 Design Control

The Contractor shall check that the design of any temporary or permanent structures proposed by the Contractor (formwork, concrete mixes, traffic control, detours, etc) comply with the relevant Code of Practice and submit to the Engineer for approval. Approval by the Engineer does not absolve the Contractor from liability for the design submitted.

2.1.4. Document Control

The Engineer and the Contractor shall have in place a satisfactory document control system that records activities of the works, correspondence, all contract documentation. All variations, instructions, claims and correspondence will be kept in an easily retrievable and secure system.

2.1.5. Purchasing

Purchased products shall have documentary evidence to verify conformance with the Contract. Current complying manufacturer's certificates shall be acceptable as evidence of conformance. In the absence of manufacturers certificates sampling must be done and test results provided.

2.1.6. Control of Customer (Employer) Supplied Product

The Contractor shall have in place means to ensure that product supplied by the Employer is handled in accordance with the specification

2.1.7. Traceability

Documentary evidence of where supplied products are incorporated in the works shall be kept

2.1.8. Process Control

The Contractor shall provide documentary evidence of the work processes to be used in carrying out the works. These shall be in the form of job instructions or manuals which describe the procedures for completing the works.

2.1.9. Inspection and Testing

The Contractor shall establish an on site laboratory with calibrated equipment specified in section 2.4. Qualified people shall be employed to carry out tests at the specified frequencies. Additional tests may be carried out at laboratories approved by the Engineer remote from the site. Where economically feasible or logistically desirable additional test equipment such as concrete cube testing apparatus shall be installed in the laboratory. Test results shall be submitted with each bill to verify the works comply with the specification. In the absence of test results, cover up work shall not proceed until conforming results are submitted.

2.1.10. Control of Inspection, Measuring and Testing Equipment

The Contractor will ensure that all equipment used to construct the work is calibrated and accurate. The Contractor will ensure that testing is carried out by laboratories which have the skills and calibrated testing apparatus to carry out the required tests. (see typical list of equipment that needs to be calibrated in Section 2.4

2.1.11. Inspection and Test status (Materials and Completed works)

The Contractor shall document all tests and non conformances

2.1.12. Control of non-conforming work

The Contractor shall document and ensure that non- conforming work is:

- Reworked to meet the specification
 - (ie low compaction rectified by further rolling)
- Accepted with or without repair with concession
 - (ie material accepted with a deduction in payment)
- Re-graded for alternative use
 - (ie material that is unsuitable for pavement utilized in embankment where it conforms)
- Rejected and scrapped
 - (ie material that has no use anywhere is removed and taken from site)

2.1.13. Corrective and Preventive Actions

The Contractor shall assess non-conforming work and ensure a process of corrective and preventive measures to eliminate the root cause of non-conformances.

2.1.14. Handling storage Packaging, Preservation and Delivery

The Contractor shall manage storage of goods as per the specification

2.1.15. Control of Quality records

The Contractor shall maintain a secure documentation system to enable Quality records to be retrieved as necessary.

2.1.16. Internal Quality Audits

The Contractor shall carry out regular self-checking to ensure the documentation and work procedures and the works comply with the Contract and Specification

2.1.17. Training

The Contractor shall implement training programs to ensure all employees and subcontractors are skilled for the work which they are to perform.

2.1.18. Safety, Environment and Social

The Contractor shall carry out the work in a safe and environmentally responsible manner in accordance with the Contract and Specification.

QUALITY ASSURANCE REQUIREMENTS

LEVEL OF CROSS CHECKING

PROCEDURE 2.3

The IRC Code SP 57 2000 recommends four classes of quality assurance they are:

1. NOMINAL QUALITY ASSURANCE (Q1)– for village roads
2. NORMAL QUALITY ASSURANCE (Q2)– for ODR and Major District Roads
3. HIGH QUALITY ASSURANCE (Q3)– for State and National Highways
4. EXTRA HIGH QUALITY ASSURANCE (Q4) – Motorways & Special Conditions

In this manual, Quality as per IRC SP57 (Q2 level) is proposed for works to be carried out to the MORT&H Specification & PWD Contract Agreement. Future projects may be extended to higher levels of QA once the principles of QA are adopted within the construction industry.

The main aspects of activities which affect the quality of a road are as follows

PROJECT INVESTIGATION

Adequacy and reliability of data	Investigation and design data collection through PWD or specialized agencies
QA systems and documentation	The Project will be prepared and approved by PWD
Topological survey	Mapping and drawing preparation will be completed by a specialized design agency
Survey equipments	Includes electronic distance measuring equipment, total station, auto levels, etc. The equipment must be suitably calibrated.

DESIGN AND DRAWING

Organisation	External organisation with approved QA systems for checking and review
Longitudinal profiles of cross-section	.....<i>tba</i> <i>as per project scope</i>
Cross drainage and other services	.....<i>tba</i> <i>As per project scope</i>
Road furniture	Drawings are to be prepared as per MORT&H & IRC Specifications.
Design review and proof checking	By ... <i>tba</i> Supervision Consultants <i>or PWD</i> .
Design modifications due to site variations or substitute materials or other reasons	By ... <i>tba</i> Supervision Consultants in consultation with the Employer <i>or PWD</i> .
As built drawing	The Contractor will submit these on completion of the works.
Maintenance of as built drawing designs, specifications and construction records	These will be prepared by the Consultants and handed over to Employer at the conclusion of services.

CONTRACTUAL ASPECTS

Prequalification Contractor	Prequalified as per bid requirements.
Specification and contract documents	Complete contract documents with full specifications will be available at site.
Quality assurance manual	This will be prepared by the Contractor and approved by PWD.
Defect liability period	1 year as per Conditions of Contract. The guarantee period for manufactured items is detailed in the MORT&H Specifications.

CONSTRUCTION ORGANISATION

Organisation of Contractor	The Contractor's staff is responsible for the execution and routine testing in accordance with the MORT&H Specifications.
Organisation of Consultants (if employed)	This is to be approved by PWD Engineer.
Organization of planning of construction activities	Construction activities are to be planned in detail. This includes material sourcing, sequencing work, resource planning, method of quality control, use of networks, review at regular intervals and resource levelling.
Supervision/ Quality Surveillance	Full time supervision of the work is to be undertaken by the PWD Engineer until Quality Assurance principles are demonstrated to be working effectively on site. There will also be periodic visits by the Designer when requested.
Audit	Random audits will be undertaken by PWD Engineer.

MATERIALS

Materials from natural source	These will be purchased either from established suppliers or from other sources. Testing by the Contractor and approval by the PWD Engineer is necessary.
Factory manufactured items including cement, steel & bitumen	Manufacturer's test certificate is required for initial acceptance. Regular testing will be undertaken at specified frequencies during construction. These frequencies will be based on QA procedures.
Records for all materials	Records of purchase dates and retention of manufacturer's test certificates will be ensured.
Testing facilities	There will be a testing facility at site. Random audit and Special testing is to be done at an independent laboratory by the PWD Engineer at a mutually agreed frequency according to QA procedures. An audit on the site laboratory will also be undertaken. Laboratory equipment will be regularly

	calibrated in accordance with the manufacturer's recommendations.
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Coarse aggregates grading	Sampling and testing will be conducted daily at the production facility. The tests will be conducted as per the Specifications.
Physical tests	These will be conducted at the commencement of mix design and before any source changes.
Aggregate reactivity	This is mandatory for source selection and whenever there is a change in source.
Fine aggregate (sand)	At the time of mix design. The frequency of testing will be in accordance with the Specifications.
Borrow materials (grading, physical tests)	As per MORT&H Specifications.
Deleterious materials	At the time of selection and as per MORT&H Specifications.
Water suitability	To be tested at commencement, change of source and after the monsoon.
Cement test	As per MORT&H Specifications.
Add mixture and its dosage	Chemical analyses will be conducted and approved.
Reinforcing steel	As per MORT&H Specifications.
Bitumen	Physical tests are to be conducted prior to unloading the storage tanks. Chemical tests are to be conducted at commencement and whenever there is a change of source.
Road marking	Manufacturer's test certificate is required and additional testing is to be undertaken at the Consultant's discretion.
Road sign	As per relevant IRC Code SP 67 for permanent signs and IRC SP? for temporary signs
Road furniture	Accept manufacturer's test certificates.

WORKMANSHIP

Working of supervision	Skilled workers having necessary training and experience are required.
Mix design sub base, base and pavement courses	Testing is to be performed at the commencement of the work. Subsequent Quality Control as per MORT&H Specifications will also be ensured.
Fabrication and fixing of reinforcement	Site bending by skilled workers is to be conducted with regular checks by supervisors. Bar bending schedules will be made and checked by the Engineers. Placing of reinforcement is also to be checked and approved by the Engineers.

Form work Materials	Steel formwork to be used as specified in the Contract Documents. Any other materials conforming to codes and capable of giving the desired finish will be used only after written approval of Engineer.
Design check	Checking and approval will be conducted by the Bridge Design Engineer.
Tolerance, geometric	This is to be checked by the Engineer.
Earth works Test for density	As per the MORT&H Specifications, each compacted layer is to be checked by the Engineer.
Geometry check	All layers are to be crosschecked by the Engineer.
Equipments	Vibrating rollers are mandatory.
Granular sub bases Materials	Materials are to be premixed to suitable grading as per the mix design requirements.
Laboratory test	Each layer to be sampled and tested as per the MORT&H Specifications.
Granular bases/binder course bases Aggregates	Crushing and screening is mandatory.
Binder quality	The binder will be tested upon arrival and unloaded to a storage tank after the results have been obtained.

WORKMANSHIP

Paving	Sensor paver.
Compaction	Vibratory steel drum roller equipment is mandatory in addition to PTR for BC Wearing Course.
Geometry checks	The Engineer will crosscheck all layers.
Geometry checks	The Engineer will crosscheck all layers.
Wearing course – Bituminous concrete Materials	Crushing and screening of aggregate is mandatory.
Mixing	Weigh batch hot mix plant.

Paving	Sensor paver.
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FIELD LABORATORY EQUIPMENT

PROCEDURE 2.4

Laboratory Equipments procured for this project are as follows:

GENERAL

- ⇒ 20 kg capacity self indicating scale. 1 No.
- ⇒ 500 gm capacity semi self-indicating electronic scale (Accuracy 0.01 gm). 2 No.
- ⇒ Sieves : as per I.S. 460-1962 1 No.
- ⇒ I.S. Sieve sets 450 mm internal dia as per IS of required sieve sizes complete with lid and pan. 1 Set
- ⇒ Sieve shaker capable of taking 200 mm and 450 mm dia sieves-electrically operated with time switch assembly (As per IS) 1 Set
- ⇒ 100 tonnes compression testing machine 1 No.
- ⇒ Glassware comprising beakers, pipettes, dishes, measuring cylinders (100 to 1000 cc capacity) glass rods and funnels, glass thermometers range 0° C to 100° C and metallic thermometers range upto 300° C, spatulas, wire gauzes, steel scales, measuring tape, casseroles, karahis, enameled trays of assorted sizes, pestle-mortar, porcelain dishes, gunny bags, plastic bags, chemicals, digging tools like pickaxes, shovels etc 1 Set

FOR SOILS

- ⇒ Compaction apparatus (Proctor) as per ISI-2720 (Part 7) complete with collar, base plate & rammers 1 No..
- ⇒ Modified AASHTO compaction apparatus as per IS-2720 (Part 8) 1974 or Heavy Compaction Apparatus as per IS complete with collar, base plate and rammer 1 No.
- ⇒ Sand pouring cylinder with conical funnel and tap complete as pr IS-2720 (Part 28) 1974 including modified equipment 2 No.
- ⇒ Sampling tins with lids 100 mm dia x 75 mm ht. ½ kg capacity and miscellaneous items like moisture, tins with lid (50 grams) etc. 1 Set
- ⇒ Speedy moisture meter complete with chemicals 2 No.

FOR CEMENT, CONCRETE AND MATERIALS

- Cube moulds. 150 mm and 100 mm 12 nos.
- Flakiness and elongation index test apparatus 1 nos
- Aggregate Impact Test apparatus as per IS-2386 (Part 4) 1963 1 nos.
- Equipment for slump test slump cone 2 nos.
- Equipment for determination of specific gravity for fine and coarse aggregate as 1 No.

per IS-2386 (Part 3), 1963

Needle vibrator

0.5 cu ft, 1 cu ft cylinder for checking bulk density of aggregate with tamping rod

3 No.

1 Set

FOR CONTROL OF PROFILE AND SURFACE EVENNESS

Steel measuring tape

5 m long straight edge

30 m long measuring tape

1 set

2 Sets

1 Set

TESTING FREQUENCIES

PROCEDURE 2.4.1

A.1. Embankment/ Subgrade

Item	Method	Frequency	Specification	Engineer's Audit Check Frequency
Plasticity Index	IS 2720 Part 5	2 tests per 3000 m ³	<45%	To check at least 15% of the tests during execution.
Liquid Limit	IS 2720 Part 5	2 tests per 3000 m ³	<70%	To check at least 15% of the tests during execution.
Free Swelling Index	IS 2720 Part 5	As required	<50%	To check at least 15% of the tests during execution.
Maximum Dry Density (Proctor)	IS 2720 Part 8	2 tests per 3000 m ³	1.52gm/cc(min) for embankment 1.75gm/cc(min) for subgrade	To check at least 15% of the tests during execution.
CBR Value	IS 2720 Part 16	1 tests per 3000 m ³	>5% for embankment >8% for sub grade	To check at least 15% of the tests during execution.
Field Density	IS 2720 Part 8	2 tests per 3000 m ³	97% for subgrade 95% for embankment	To check at least 15% of the tests during execution.

A.2. Granular Sub-Base

Item	Method	Frequency	Specification	Engineer's Audit Check Frequency
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Liquid Limit	IS 2720 Part 5	1 tests per 200 m ³	<25%	To check at least 15% of the tests during execution
Plasticity index	IS 2720 Part 5	1 tests per 200 m ³	<6%	To check at least 15% of the tests during execution.
10% Fines Value	BS 812, Part III	1 tests per Source	>50 KN	To check at least 15% of the tests during execution.
Water Absorption	IS 2727 Part 7	1 tests per Source	<2%	To check at least 15% of the tests during execution.
Maximum Dry Density	IS 2720 Part 8	2 tests per 1000 m ³	-	To check at least 15% of the tests during execution.
CBR Value	IS 2720 Part 16	1 tests per 3000 m ³	As per Grading	To check at least 15% of the tests during execution.
Sieve Analysis	IS 2386 Part 1	1 tests per 100 m ³	As shown in table A.3 below	To check at least 15% of the tests during execution.

A.3. Grading requirement for Granular Sub-Base

Sieve size (mm)	Specification limits (percent passing)		
	Grading I	Grading II	Grading III
75	100	-	-
53	80-100	100	-
25.5	55-90	70-100	100
9.5	35-65	50-80	65-95
4.75	25-65	40-65	50-80
2.36	20-40	30-50	40-65
0.425	10-25	15-25	20-35
0.075	3-10	3-10	3-10
CBR	30	25	20

A.4. Wet Mix Macadam & Non Bituminous Base Course

Item	Method	Frequency	Specification	Engineer's Audit Check Frequency
Los Angeles abrasion	IS 2386, Part 4	1 test per 200 m ³	<40%	To check at least 15% of the tests during execution
Combined flakiness index	IS 2386 Part 1	1 test per 200 m ³	<30%	To check at least 15% of the tests during execution
Atterberg limits	IS 2720, Part 5	1 test per 100 m ³	-	To check at least 15% of the tests during execution
Plasticity index	IS 2720 Part 5	1 tests per 200 m ³	<6%	To check at least 15% of the tests during execution.
Water Absorption	IS 2727 Part 7	1 tests per Source	<2%	To check at least 15% of the tests during execution.
Maximum Dry Density	IS 2720 Part 8	2 tests per 1000 m ³	-	To check at least 15% of the tests during execution.
Sieve Analysis	IS 2386 Part 1	1 tests per 100 m ³	As per MORT&H table 400-11	To check at least 15% of the tests during execution.
Field Density	IS 2720 Part 28	1 tests per 500 m ²	98% of Maximum Dry Density	To check at least 15% of the tests during execution.

A.5. Bituminous Macadam & Other Bituminous Base Course

Item	Method	Frequency	Specification	Engineer's Audit Check Frequency
Quality of Binder	IS 73, IS 217, IS 8887	1 tests per lot	60/70 unless otherwise Specified	To check at least 15% of tests during execution

Los Angeles abrasion	IS 2386, Part 4	1 test per 50 m ³	<40%	To check at least 15% of the tests during execution
Flakiness and Elongation	IS 2386 Part 1	1 test per 50 m ³	<30%	To check at least 15% of the tests during execution
Soundness	IS 2386, Part 5	1 test per 50 m ³	<12 for NgSO ₄ <18% for MgSO ₄	To check at least 15% of the tests during execution
Stripping test	IS 6241	1 test per 100 ³	>95%	To check at least 15% of the tests during execution.
Absorption	IS 2720 Part 8	3 tests per Source	<2%	To check at least 15% of the tests during execution.
Grading of aggregates	IS 2386 Part 1	1 test per 25 m ³	As per job mix formula	To check at least 15% of the tests during execution.
Density of compacted layer	ASTM-D 1559	1 test per 250 m ²	As per MORT&H Section 900	To check at least 15% of the tests during execution.

A.6. Concrete

Item	Method	Frequency	Specification	Engineer's Audit Check Frequency
Aggregate Impact Value	IS 2386	1 tests per lot	<30%	To check at least 15% of tests during execution
Los Angeles abrasion	IS 2386, Part 4	1 test per 50 m ³	<40%	To check at least 15% of the tests during execution

Flakiness and Elongation	IS 2386 Part 1	1 test per source	<35%	To check at least 15% of the tests during execution
Specific	IS 2727	1 test per	-	To check at least 15% of the

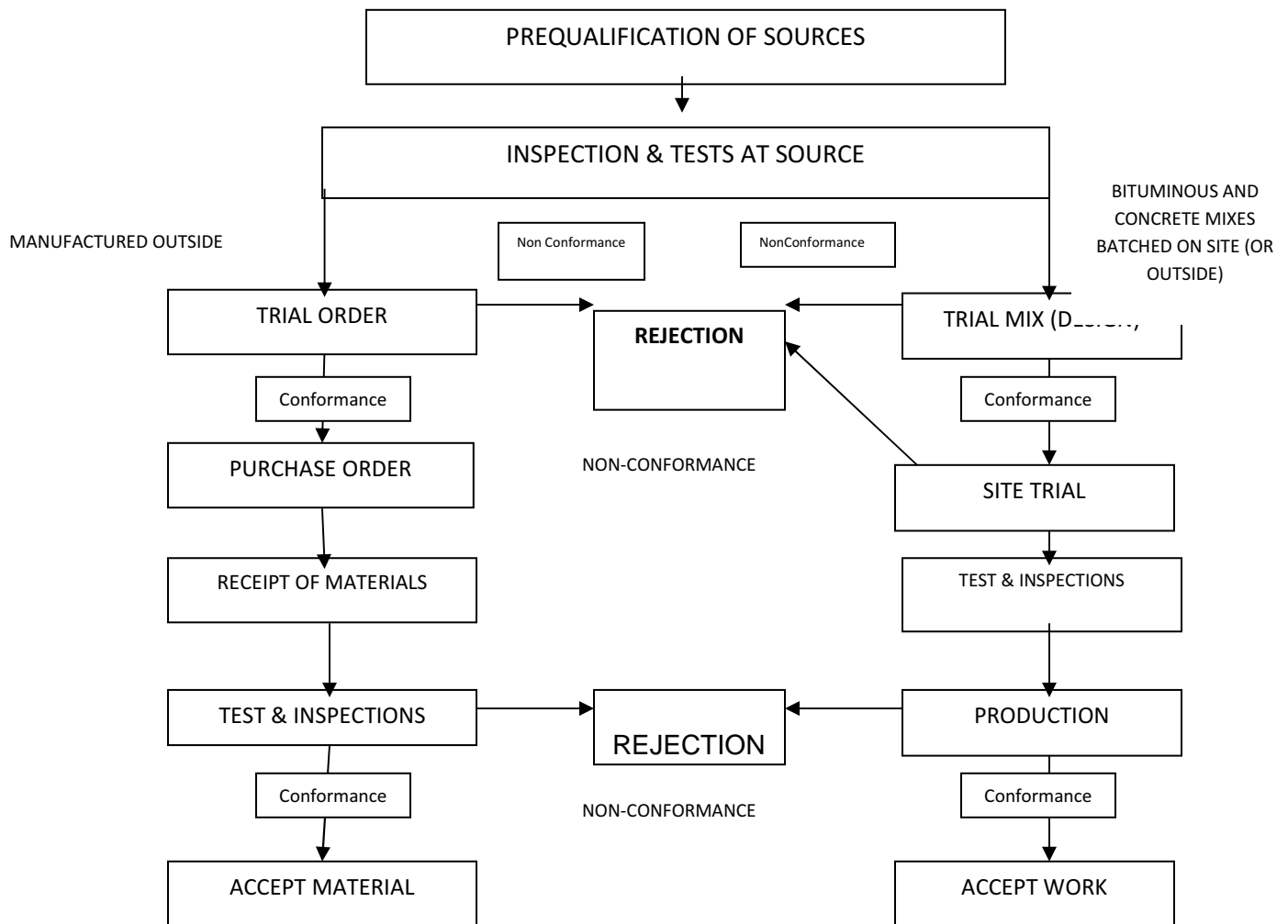
Gravity	Part 8	Source		tests during execution
Absorption	IS 2720 Part 8	1 test per Source	<2%	To check at least 15% of the tests during execution.
Soundness	IS 2386, Part 5	1 test per source	<12 for NgSO_4 <18% for MgSO_4	To check at least 15% of the tests during execution
Grading of Aggregates	IS 2386 Part1	1 test per source		To check at least 15% of the tests during execution.
Compressive Strength	IS 516	As per the table below	As per the table below	To check at least 15% of the tests during execution.

Compressive strength of the concrete shall be tested in accordance with IS 516. Three test specimens of 150mm cubes (cubes shall be prepared as per IS 1199) shall be made, cured and tested at the age of 28 days for compressive strength in each samples. The minimum frequency of sampling of concrete of each grade shall be as per the following table.

Quantity of Concrete in Work, M^3	No. of Samples	Acceptance Criteria
1 - 5	1	<ul style="list-style-type: none"> The mean strength determined from any group of four consecutive samples should exceed the specified characteristic compressive strength. Strength of any sample is not less than the specified characteristic compressive strength minus 3 Mpa.
6 - 15	2	
16 - 30	3	
31 - 50	4	
51 and above	4 plus one additional sample for each additional 50m^3 or part thereof	

The above tests are those most likely required to provide assurance of quality in road and bridge works. Additional to the above tests the Engineer may request tests in accordance with testing frequencies specified in MORT&H Specification for Road and Bridge works Table 900 and those required under the Special Conditions of Contract.

**FLOWCHART FOR PROCUREMENT OF MANUFACTURED ITEMS
PROCEDURE 2.5**



CONTRACT REFERENCES

Trial Mix Procedure for Bituminous Work

Bituminous Macadam MORT&H Clause. 504.2.3 and 504.3.4

Dense Bituminous Macadam MORT&H Clause. 507.3

Bituminous Concrete MORT&H Clause 509

Trial Mix for Concrete

MORT&H Clause 1704.2

The Contractor shall maintain separate registers for recording the mixing and delivery of all materials. A summary of each days work will be forwarded to the Supervision Consultant.

METHODOLOGY AND CHECKLISTS

PROJECT QUALITY PLAN

PROCEDURE NUMBER 2.6

METHODOLOGY FOR ROAD WORKS

PROCEDURE 2.6.1

OBJECTIVE

The purpose of this procedure is to establish the construction procedure, equipment requirements, role of the Contractor and Specification requirements for road works.

FIXING OF ROAD ALIGNMENT (FIXING OF CENTER LINE AND TOE LINE).

EQUIPMENT REQUIRED

Total Station, Ranging Rod, Auto Level, Staff.

Execution Procedure

Procedure	Responsibility	Check by	Remarks/Records
The center line and toe line fixing	Surveyor	Consultant's Surveyor as per MOST 902.2 for horizontal alignment	Interval of 50m c/c longitudinally and shifted beyond toe line in right of way on both sides.

Role of Contractor

The Contractor is responsible for maintaining the centreline pillar and for shifting it to the main carriageway during the construction of embankment/ subgrade. The Contractor has to mark the toe line in every layer of filling.

ROAD WAY – CLEARING & GRUBBING

Equipment Required

Dozer/Grader, Excavator, Dumpers.

Execution Procedure

After fixing the centre line and toe line, the clearing and grubbing activities are to commence. The formation width has to be cleared of any vegetation. The dozer/excavator will remove about 150mm and free the stretch from materials such as bushes, shrubs, stumps, grass, weeds, top organic soil etc. The dozed material will be completely cleared from the toe width. Roots and stumps that were not removed by the dozer will be excavated and disposed of. All excavation below the ground level arising resulting from the removal of tree stumps will be filled with a suitable material and compacted thoroughly so as to make the surface at this point conform to surrounding area. If the area is water logged it has to be dewatered and exposed to the sun till it dries out. After the stretch is cleared, base preparation activity follows.

Role of Contractor

The whole activity as discussed above is part of Contractor's responsibility.

EXCAVATION

PROCEDURE 2.6.2

OBJECTIVE

The purpose of this procedure is to outline the process involved in:

- ⇒ excavating the roadway to the required dimensions and levels as per the Drawings,
- ⇒ removing excavated earth, and
- ⇒ Storing the material for reuse or disposal at places agreed with clients.

Procedure	Responsibility	Check by	Remarks/ Records
Set out Excavation limits at 50 meter intervals in plain terrain, and at 20 meter intervals in all curve points true to lines, curves, slopes, grades and sections.	Contractor	Field Engineer	
Agree with Engineer regarding the disposal area and inform the Engineer of the quantity.	Contractor	Field Engineer	Location of disposable area record to be maintained
Check ground water levels and implement dewatering systems if required. Keep standby DW Systems during Monsoon.	Contractor	Field Engineer	
Excavate manually or mechanically to required lines and levels. Make sure depths do not exceed the requirements.	Contractor		
Trim and Level manually at final level (tolerance ± 20 mm).	Contractor	Field Engineer	

BASE PREPARATION PROCEDURE 2.6.3

OBJECTIVE

This procedure involves the levelling and compacting of the original ground over which embankment/subgrade will be placed. (This procedure is in accordance with the requirements of MORT&H 305.3.4.)

EQUIPMENT REQUIRED

Grader, Roller, and Water Tanker.

ROLE OF CONTRACTOR

Base preparation is to be carried out by the Contractor. The Contractor shall arrange all tests and the Engineer shall observe and randomly audit and check test samples.

EXECUTION PROCEDURE

Procedure	Responsibility	Check by	Remarks/ Records
The base sample is taken and given to the lab in charge to determine the modified proctor density and CBR value.	Lab	CBR to be checked by the Engineer.	
After bed preparation, field density tests should be carried out to determine the degree of compaction.	Lab	Density of 95% compaction on MDD to be checked by the Engineer.	

Non Conformity

There will be “non conformity” when the ground does not have 95% relative compaction with respect to the dry density.

Corrective Action

The ground will be scarified and water will be sprinkled uniformly at a controlled rate mixed in the soil by blading, discing or harrowing. This will help to obtain a uniform moisture content throughout the depth of the layer. The soil will then be compacted by a vibratory roller. Control of moisture will be achieved by a rapid moisture meter after calibration.

EMBANKMENT FILLS PROCEDURE 2.6.4

EQUIPMENT REQUIRED

Excavators, Dumpers, Water Tankers, Vibratory Roller, Dozer, Motor Graders.

PREREQUISITES

Selection and approval of Borrow Area as per Procedure 2.5 in this Manual: *Control of Materials*.

Procedure	Responsibility	Check by	Remarks/Records
The approved borrow area material is brought to the stretch	Contractor	Lab	Material is as per MORT&H 3.5.2.1. Approved test reports for the borrow area are necessary.
The dumped material is to be graded and spread. The layer thickness is not to exceed 200mm.	Contractor	Field Engineer	Where the layer thickness is in excess of that required, the excess material is to be moved to a deficient zone.
The spread material should be made free of deleterious materials such as twigs, stems and large boulders.	Contractor	Field Engineer	
The spread material is to be graded to the required camber.	Contractor		
The stretch is to be watered properly so as to achieve required OMC. Proof rolling should be carried out to check the number of passes to	Contractor as per MORT&H 305.3.5 Contractor	Lab - OMC and MDD for compaction – 2 test for every 3000 m ³ of soil. Checked by the Engineer	The amount of water to be added to the soil will be calculated as OMC minus NMC.

Procedure	Responsibility	Check by	Remarks/Records
attain the MDD.			
When moisture content of stretch has reached requisite OMC, the stretch is to be rolled to achieve the desired compaction.	Contractor as per MORT&H 305.3.6		
After rolling, testing will be carried out to check the required compaction has been achieved.	Contractor	Lab. Compaction 95% as per table 300.2, CL:900 MORT&H Cross-checked by the Consultant's Field Engineers.	
The Contractor will take levels for alternate layers.	Contractor	Engineer	Level check sheet
Camber preparation string method is to be used.	Contractor	Field Engineer	
Formation layer nos. shall be marked by paint.	Contractor	Field Engineer	

Non Conformity

This will occur when the mean dry density is less than specified dry density.

The Standard Deviation of at least 5 test results should be below 0.08g/cc.

Corrective Action

- ⇒ Increase the number of passes, scarify, control the moisture and re-compact.
- ⇒ When the Standard Deviation is more than 0.08g/ccm, increase the number of tests and identify the stretch showing the wide variation from mean field dry density. Solve the problem by conducting confirmatory tests for samples collected from areas along the stretch.

SUBGRADE PREPARATION PROCEDURE 2.6.5

EQUIPMENT REQUIRED

Grader, Dozer, Water Tanker and Vibratory Roller.

ROLE OF CONTRACTOR

The above activity is to be carried out by the Contractor. The Consultant will conduct all necessary testing.

PREPARATION MATERIAL

Procedure	Responsibility	Check by	Remarks/ Records
When the subgrade is prepared, the soil will be checked for a compaction of 97%.	Contractor's Laboratory. One test per 250m length of road.	The Engineer	Record file
The subgrade material will be spread in layers of uniform thickness and compacted. The layer thickness is not to exceed 200mm.	Contractor	Field Engineer	Test report

WATER APPLICATION

Optimum Moisture Content (OMC) and Maximum Dry density (MDD) will be determined for the light compaction at a frequency of 2 tests for every 3000 m ³ of soil.	Contractor's Laboratory.	The Engineer	Test reports
The amount of water to be added to the soil will be calculated as OMC minus NMC. The water will be sprinkled from a water tanker uniformly with a controlled flow rate.			

MIXING OF SOIL

After adding the required amount of water as per MORT&H 5.3.6.3, the soil will be mixed by graders, harrows, or rotary mixers (rotators) until the layer is uniformly wet. Hard lumps of earth will be broken to a maximum size of 75mm.	Contractor		
Proof Rolling	Contractor	Checked by the Engineer	

COMPACTION

Each layer of the material will be thoroughly compacted to the specified densities by a vibratory roller that has a static weight of 16 tons.	Contractor	The Engineer	Layer thickness < 200
Field density tests will be conducted at a frequency of one measurement for every 250m ² of compacted area for each layer. The sand replacement method will be used.	Contractor	Cross checked by Field Engineers	
After completion of cut and fill operations, the surface will be proof rolled by 6-8 passes of a 10-ton roller.	Contractor		
Formation layer nos. shall be marked by paint.	Contractor		

Non Conformity

The Mean Dry Density of 10 test results should not be less than the specified dry density.

The Standard deviation of at least 10 test results should be below 0.08g/cc.

Corrective Action

Increase number of passes, scarify, control the moisture and re-compact.

In the case where the Standard Deviation is more than 0.08g/cu cm, the number of tests should be increased to identify the stretch showing wide variation from mean field dry density. The problem can be addressed by doing confirmatory tests for samples collected from areas along the stretch.

GRANULAR SUBBASE PROCEDURE 2.6.6

OBJECTIVE

This procedure relates to the laying and compacting of well-graded material onto prepared subgrade in accordance with MORT&H 401.1.

EQUIPMENT REQUIRED

Excavator, Dumpers, Dozer, Grader, Water Tanker, and Vibratory Roller.

PREREQUISITE

Before this process can commence, the selection and approval of Material Source/ Borrow Area of Crushed Materials (as per Procedure 2.5, Control of Materials) must be completed.

Procedure	Responsibility	Check by	Remarks/ Records
The GSB material will be brought from an approved borrow area/crusher site.			
The material brought to site will be identified and approved for laying.	Contractor	Laboratory as per MORT&H 401.4.2	
The sub base layer will be laid in a single layer of thickness 150mm by grader.	Contractor		
The required amount of water (i.e. 1% above to 2% below the OMC requirement), will be added until layer is uniformly wet.	Contractor		
Each layer will be compacted by a vibratory roller of 16 tons capacity.	Contractor	Surface Tolerance: - 20mm, +10mm FDD:98% of MDD FieldEngineer	
Rolling will be commenced at the lower edge and proceed towards the upper edge longitudinally for the areas of unidirectional crossfall (camber) and superelevation.	Contractor		In areas of cross fall (camber) on both sides, rolling will commence from the edges and progress towards the center.

Procedure	Responsibility	Check by	Remarks/ Records
Rolling will be done uniformly, overlapping the preceding pass of rolling by not less than one-third of the track.	Contractor		The speed of the roller will not exceed 5km per hour.
The grade and camber will be checked during rolling work for high spots or depression.	Contractor	Surface Tolerance:- 20mm, +10mm, FDD:98% of MDD	Any high spots or depressions will be corrected by removing or adding fresh material.
Rolling will be continued till the field density is achieved.	Contractor	Field Engineer	Field density for each compacted layer will be checked at the rate of one test per 500m ² .

NON CONFORMITY

The mean dry density of 10 test results should not be less than specified dry density.

Standard deviation of at least 10 test results should be below 0.08g/cc.

CORRECTIVE ACTION

Increase number of passes, scarify, control the moisture and re-compact.

When the Standard Deviation is more than 0.08g/cc, increase the number of tests and identify the stretch showing wide variation from mean field dry density. Solve the problem by doing confirmatory tests for samples collected from areas along the stretch.

WET MIX MACADAM

PROCEDURE 2.6.7

OBJECTIVE

This sections outlines the procedure for laying and compacting clean, crushed, graded aggregate and granular material onto a prepared subbase (GSB) as per the requirement of MORT&H 406.0.

The material shall be laid in one or more layers in accordance with the approved drawings.

EQUIPMENT REQUIRED

Wet Mix Plant (60t/Hr.), Grader, Vibratory Roller, Water Tanker, and Paver.

Before this activity commences, the following activities must be completed.

- ⇒ Identification of the plant locations - preferably equidistant from both start and end of the package.
- ⇒ Leasing of the identified area.
- ⇒ Construction of foundations.
- ⇒ Erection of plant.
- ⇒ Identification of the aggregate source and confirmation of its acceptability as per MORT&H table 400-10/11.
- ⇒ Transportation of aggregate and stacking near the plant.
- ⇒ Preparation of job mix formula.

Execution Procedure

Procedure	Responsibility	Check by	Remarks/ Records
Wet Mix Macadam will be prepared in the plant with controlled addition of water.	Contractor	Laboratory	The granular material will be of crushed stone conforming to MORT&H 406.2.1.1
The wet mix will be spread either by a paver finisher or motor grader to the full width of formation (i.e. carriageway and hard shoulders) without the segregation of larger and finer particles.	Contractor	Surface Tolerance : +10mm, -10mm	The required camber will be given using peg and string.
Immediately after mixing, the aggregates will be spread uniformly with paver/motor grader evenly upon the prepared subbase in layers of 150mm (compacted thickness).	Contractor		
Layers along forms, kerbs, walls or other places not accessible to the roller will be thoroughly compacted (to achieve 98% relative compaction) with mechanical tampers or a plate compactor.	Contractor		
Skin patching of surface area will be scarified to permit the proper bonding of added material.	Contractor		
After the rolling is completed the stretch is to be tested for degree of compaction.	Laboratory, 98% MDD (heavy compaction) as per IS 2720 OR MORT&H Cl. 903.3.1	Checked by Field Engineer	The rolling is to be done by 6-8 passes of roller.
After final compaction of WMM course, the road will be allowed to dry for 24 hours. No vehicular traffic of any kind will be allowed on the finished WMM surface till it has dried and the wearing course laid.	Contractor		

Preventive Actions to be Taken

Before laying and spreading of material, the shoulder on both sides will be constructed. This will laterally confine the wet mix macadam while compacting.

No depression should be filled with unmixed and ungraded, material or fines.

Non Conformity

The mean dry density of 10 test results should not be less than specified dry density.

Standard deviation of at least 10 test results should be below 0.08g/cc.

Surface irregularities should not appear.

Corrective Action

Increase the number of passes, scarify, control the moisture and re-compact.

When the Standard Deviation is more than 0.08g/ccm, increase the number of tests and identify the stretch showing the variation from mean field dry density. Solve the problem by conducting confirmatory tests for samples collected from areas along the stretch.

Irregularities should be within recommended tolerance. If they are not, then loosen, add or remove, level and recompact. Minimum patch areas should be 5m long x 2m wide.

DENSE BITUMINOUS MACADAM PROCEDURE 2.6.8

SCOPE

This procedure relates to the laying of Dense Bituminous Macadam with approved Mix Design for the required thickness.

PREREQUISITE

Approval of materials as per procedure 2.5 in this Manual.

EQUIPMENTS REQUIRED

Batch-type Hot Mix Plant, Sensor Paver, Tandem Roller, Pneumatic Tyre Roller, Dump Trucks (15 and 25 ton capacity).

Procedure	Responsibility	Check by	Remarks/ Records
The WMM surface will be swept of dust and foreign matter.	Contractor	Field Engineer	
A priming coat over the Wet Mix Macadam for the first layer of DBM will be applied, followed by a tack coat over the first DBM layer for the second layer of DBM.	Contractor	Field Engineer	The bituminous primer will be sprayed/ distributed uniformly over the dry surface at the rate of 6-9kg per 10sq.m as per MORT&H 502.0.

PREPARATION AND TRANSPORTATION OF THE MIX

Bituminous macadam mix will be prepared in a Hot Mix weigh batch plant to attain uniform quality mix.	Contractor		The DBM produced will be transported in dumpers. It will be covered with tarpaulin to maintain
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Procedure	Responsibility	Check by	Remarks/ Records
			temperature.
Temperature of binder at the time of mixing will be in the range of 150°C to 163°C and the difference in temperature between the binder and aggregate will at no time exceed 14°C.	Contractor		
Mixing will be done thoroughly to obtain a homogenous mixture in which all the particles of aggregates are uniformly coated.	Laboratory. The mix discharge temperature will be 130°C-160°C.		
The mix will be transported from the hot mix plant to the site with suitable tipper vehicles.	Contractor		

SPREADING

The mix transported from the hot mix plant to the site will be spread by means of paver finisher to the specified grade, lines and cross section.	Contractor		
The mix will be laid manually in restricted locations and in narrow widths.	Contractor		
The temperature of mix at the time of laying will be in the range of 120° - 159°C.	Contractor	Cross checked by Field Engineer	
Longitudinal joints and edges will be constructed true to the delineating lines, parallel to the centerline of the road.	Contractor		
Longitudinal and transverse joints will be constructed at least 250mm from those in the lower courses. The joints on the top most layer will not be allowed to fall within the wheel path.	Contractor		
All transverse joints will be cut vertically to the full thickness of previously laid mix with asphalt cutter/pavement breaker. The surface will be painted with hot bitumen before placing the fresh material.	Contractor		
Longitudinal joints will be preferably hot joints. Cold longitudinal joints will be properly heated with joint	Contractor		

Procedure	Responsibility	Check by	Remarks/ Records
heater to attain a temperature of about 80°C before laying adjacent material.			
After the spreading of mix, rolling will be done immediately with a speed no greater than 5km per hour. Due care will be taken to avoid unduly roughening the pavement surface.	Contractor		
Initial or break down rolling will be done with 8-10 tonne static weight smooth-wheeled roller.	Contractor	Checked by Field Engineer	
The intermediate rolling will be done with 8-10 tonne static weight vibratory roller/pneumatic tyre roller.	Contractor	Checked by Field Engineer	
The finish rolling will be done with 8 ton weight smooth wheeled tandem roller.	Contractor	Checked by Field Engineer	
All compaction operations of initial and intermediate rolling will be accomplished by using vibratory tandem roller of 8-10 ton static weight.	Contractor		
During the initial and finish rolling, no vibratory compaction will be used.	Contractor		
The wheels of roller will be kept moist to prevent the mix from adhering to them.	Contractor		
Rolling of the longitudinal joints will be done immediately behind the paving operations. After this, the rolling operations will commence longitudinally from edges and proceed towards the center, except on superelevated and unidirectional cambered portions, where it will progress from the lower to upper edge parallel to the center line of the pavement.	Contractor		
Rolling will be continued till the density is at least 98% that of the Laboratory Marshall specimen.			Test reports statistical method of acceptance MORT&H Clause 903.4.2.
Core sample taken after 24hours for density test.	Contractor/ Field Engineer jointly	Core density checked in the presence of	

Procedure	Responsibility	Check by	Remarks/ Records
		Field Engineer	

BITUMINOUS CONCRETE WEARING COURSE

PROCEDURE 2.6.9

OBJECTIVE

The work shall consist of laying bituminous base concrete of thickness 40mm on a previously prepared bituminous course.

EQUIPMENT REQUIRED

Batch or drum type Hot Mix Plant, Sensor Paver, Tandem Roller, Pneumatic Tyre Roller, Dump Trucks (15 and 25 tons capacity).

Procedure	Responsibility	Check by	Remarks/ Records
The base on which bituminous concrete is to be laid will be prepared, shaped and conditioned to the specified levels.		Field Engineer	
The surface will be thoroughly swept of dust and foreign matter.	Contractor	Field Engineer	

TACK COAT

A single layer of tack coat will be applied on a bituminous layer	Contractor	Field Engineer	Single coat will be a bituminous emulsion in the normal spraying temperature of 20°C-60°C.
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PREPARATION AND TRANSPORTATION OF MIX

Same as dense bituminous macadam

SPREADING

The mix transported from the Hot Mix plant to the site will be spread by means of a paver finished to the specified grade, lines and cross-section.	Contractor	Field Engineer	The mix will be laid manually in restricted locations and
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Procedure	Responsibility	Check by	Remarks/ Records
			narrow widths.
The temperature of the mix at the time of laying will be in the range of 120°C-160°C.	Contractor	Field Engineer	
Longitudinal joints and edges will be constructed true to the delineating lines, parallel to the centerline of the road.	Contractor	Field Engineer	Longitudinal and transverse joints will be constructed by at least 250mm offset from those in the lower courses.
All transverse joints will be cut vertically to the full thickness of previously laid mix with an asphalt cutter/ pavement breaker. The surface will be painted with hot bitumen before placing the fresh material.	Contractor	Field Engineer	
Longitudinal joints will be preferably hot joints. Cold longitudinal joints will be properly heated with joint heater to attain a temperature of about 80°C before laying adjacent material.	Contractor	Field Engineer	
compaction			
After the spreading of mix, rolling will be done immediately with a speed no greater than 5km per hour. Rolling operations will be completed before the temperature of the mix falls below 100°C.	Contractor	Field Engineer	Initial or break down rolling will be done with 8-10 tones static weight smooth-wheeled roller.
Rolling of the longitudinal joints will be done immediately behind the paving operations. After this, the rolling operations will commence longitudinally from the edges and proceed towards the center, except on superelevated and unidirectional cambered portions, where it will progress from the lower to upper edge parallel to the center line of the pavement.	Contractor	Field Engineer	Rolling will be proceed on the fresh material with rear or fixed wheel leading so as to minimize the pushing of the mix. Each pass of the roller will overlap the preceding one by half the width of

Procedure	Responsibility	Check by	Remarks/ Records
			the rear wheel.
Rolling will be continued till the density achieved at least 97% of that of lab Marshall specimen.	Contractor	Field Engineer	Test reports. Statistical method for acceptance MORT&H Clause 903.2.2.
Traffic will be allowed after completion of the final rolling when the mix has cooled down to the surrounding temperature.	Contractor		
A core is taken 24hours after compaction and checked for density.		Check in presence of Consultant's Materials Engineer	

BACKFILLING, COMPACTION, RUBBLE PACKING

PROCEDURE 2.6.10

OBJECTIVE

This procedure relates to backfilling and compacting areas around structures.

Procedure	Responsibility	Check by	Remarks/Records
Bench the vertical sides of excavation so that adequate space is created between the abutment/retaining walls and Excavation as to allow a Place Compactor inside.	Contractor	Field Engineer	
Mark Layer Levels and Number (on walls).	Contractor	Field Engineer	
Sample Backfill material, determine OMC and MDD.	Contractors Lab	Field Engineer	
Premix water in the fill material, maintain +2% above optimum level, spread to required level and compact using Compactor (Min.10-12 passes).	Contractor	Field Engineer	
Determine <i>in situ</i> Density (Minimum of 3 tests per 200m ²).	Lab	Field Engineer	
Proceed with compacting in layers till required level is reached.	Contractor		
Manually place 600mm filter media in parallel with backfill layer.	Contractor		Investigate cheaper alternatives (no-fines concrete?)
Check level, control undulations.	Contractor	Field Engineer	

FORMWORK

PROCEDURE 2.6.11

OBJECTIVE

This section outlines the procedure to be adopted when constructing Formwork for Retaining Walls, Columns, Beams, Slabs, etc. that are true to dimensional requirements, water tightness, rigidity, etc. as per Designs/ Standard practices.

Procedure	Responsibility	Check by	Remarks/Records
Review Construction drawings, design system formwork, and prepare formwork drawings/sketches.	Contractor	Engineer with delegated authority	
Calculate the material requirements based on drawings.	Contractor		
Fabricate standard Panels for Retention Walls, Columns, Beam sides, etc. as per drawings.	Contractor	Field Engineer	
For <i>in situ</i> forms, place props over solid bases or timber over compacted ground.			
Check all cross falls and joints.		Field Engineer	
Clean, apply mould release, and place Reinforcement Concrete.	Contractor		
Deshutter at specified time and strengthen without shock. Stack all components neatly for reuse.	Contractor		

REINFORCEMENT CUTTING, BENDING, FIXING

PROCEDURE 2.6.12

OBJECTIVE

This section discusses the following issues:

The receipt and stacking of reinforcement

The approval of reinforcement

The cutting and bending of reinforcement as per the bar schedules

The minimisation of waste

Procedure	Responsibility	Check by	Remarks/Records
Obtain Construction Drawings and prepare a bar schedule. Calculate the required quantities.	Contractor	The bar schedule is to be approved by the Engineer.	
Select the reinforcement suppliers either by independent testing or reviewing the test certificates.	Contractor		
Place the order.	Contractor		
Receive the order and stack diameter-wise. They should be covered with tarpaulin and stacked in line with the cutting machine.	Contractor.		
If the Steel has not been tested before delivery, collect samples and send for testing.	Contractor, Laboratory	Field Engineer	
Prepare the bar bending schedule from the approved working drawings.	Contractor	Field Engineer	
Cut, bend and dispatch to site.			
Receive the reinforcement at the site.	Contractor		
Mark the spacing using chalk; place the bars in both directions and fix.	Contractor		

CONCRETING: GENERAL

PROCEDURE 2.6.13

OBJECTIVE

To ensure the right quality of mix is manufactured, placed and vibrated such that the structure achieves the desired finish, strength and durability.

This procedure also applies to Bituminous Works – General.

EQUIPMENT REQUIRED

Concrete Batching Plant, Concrete Transit Mixer 6 cu m capacity, concrete skip and crane, poker vibrators, concrete pump.

Procedure	Responsibility	Check by	Remarks/ Records
Prepare Concreting Program for the following week.	Contractor's Engineer in charge of Structures		
Ensure availability of Aggregates, Sand, Cement Admixtures, etc. If Materials are deficient, initiate action.			
Ensure Batching Plant, Transit Mixer, and Pump are maintained. If problems are anticipated, provide for standby or alternate supply.	Contractor		
Contemplate emergency stop-end procedures.	Contractor	Field Engineer	Obtain advance permission from the Engineer
Formwork and reinforcement is to be approved.	Contractor	Field Engineer	
Check Pour Card has been approved.	Engineer in charge of Structures	Checked by Field Engineer	
Site Engineer to set up Crane or Pump in position, check all equipment (Vibrator, Compressor, etc) and keep Stand-bys available.	Contractor		

